



Digitized by the Internet Archive
in 2022 with funding from
University of Toronto

CA1
Z 1
-74M21

(5)

MACKENZIE VALLEY PIPELINE INQUIRY

Government
Publications

IN THE MATTER OF APPLICATIONS BY EACH OF
(a) CANADIAN ARCTIC GAS PIPELINE LIMITED FOR A
RIGHT-OF-WAY THAT MIGHT BE GRANTED ACROSS
CROWN LANDS WITHIN THE YUKON TERRITORY AND
THE NORTHWEST TERRITORIES, and
(b) FOOTHILLS PIPE LINES LTD. FOR A RIGHT-OF-WAY
THAT MIGHT BE GRANTED ACROSS CROWN LANDS
WITHIN THE NORTHWEST TERRITORIES
FOR THE PURPOSE OF A PROPOSED MACKENZIE VALLEY PIPELINE
and

IN THE MATTER OF THE SOCIAL, ENVIRONMENTAL AND
ECONOMIC IMPACT REGIONALLY OF THE CONSTRUCTION
OPERATION AND SUBSEQUENT ABANDONMENT OF THE
ABOVE PROPOSED PIPELINE

(Before the Honourable Mr. Justice Berger, Commissioner)

Yellowknife, N.W.T.

March 17, 1976.

PROCEEDINGS AT INQUIRY

Volume 131

APPEARANCES:

Mr. Ian G. Scott, Q.C.,
Mr. Stephen T. Goudge,
Mr. Alick Ryder and
Mr. Ian Roland for Mackenzie Valley Pipeline
Inquiry;

Mr. Pierre Genest, Q.C.,
Mr. Jack Marshall, and
Mr. Darryl Carter for Canadian Arctic Gas
Pipeline Limited;
Mr. Reginald Gibbs, Q.C.,
Mr. Alan Hollingworth &
Mr. John W. Lutes, for Foothills Pipe Lines Ltd.;

Mr. Russell Anthony &
Pro. Alastair Lucas for Canadian Arctic Resources
Mr. Garth Evans Committee;

Mr. Glen W. Bell and
Mr. Gerry Sutton, for Northwest Territories
Indian Brotherhood, and
Metis Association of the
Northwest Territories;

Mr. John Bayly
or
Miss Leslie Lane for Inuit Tapirisat of Canada,
and The Committee for
Original Peoples Entitle-
ment;

Mr. Ron Veale and
Mr. Allen Lueck for The Council for the Yukon
Indians;

Mr. Carson H. Templeton, for Environment Protection
Board;

Mr. David Reesor for Northwest Territories
Association of Municipal-
ities;

Mr. Murray Sigler for Northwest Territories
Chamber of Commerce.

Mr. John Ballem, Q.C., for Producer Companys;

347
M835
V01.131

Williams, Purcell, Hollingshead,
Minning, Cooper, Clark
Cross-Examination by Gibbs

I N D E X

Page

WITNESSES FOR CANADIAN ARCTIC GAS PIPELINE LIMITED:

Guy Leslie WILLIAMS
Hoyt PURCELL
Garry Wood HOLLINGSHEAD
Miss Gretchin V. MINNING
Richard H. COOPER
John Ivor CLARK

- Cross-Examination by Mr. Gibbs (cont) 19840
- Cross-Examination by Miss Lane 19981

EXHIBITS:

- 497 Tables showing natural resource requirements
for pipeline construction 19935

Williams, Purcell, Hollingshead,¹⁹⁸⁴⁰
Minning, Cooper, Clark
CrossExam by Gibbs

Yellowknife, N.W.T.

March 17, 1976.

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

GUY LESLIE WILLIAMS,
HOYT PURCELL,
GARRY WOOD HOLLINGSHEAD
MISS GRETCHIN V. MINNING
RICHARD H. COOPER,
JOHN IVOR CLARK, resumed:

CROSS-EXAMINATION BY MR. GIBBS (CONTINUED):

Q Mr. Williams, I just wanted to review briefly this ditch configuration to make sure I understand it, across Shallow Bay. Yesterday Dr. Clark said that the ditch would be 20 feet below water level or 10 feet below the level of the water bottom, whichever was the greater. I have it correct so far, do I?

WITNESS WILLIAMS: 20 feet below water, or 10 feet below bottom, whichever is greater. Yes, sir.

Q And that was to the top of the pipe?

A Yes sir.

Q And as it's a 36-inch pipe to get to the bottom of the trench we'd add about another four feet.

A Yes sir.

Q And the result of that is that if you're operating, for example, in two feet of water, the top of the trench to the bottom of the trench would be about 22 feet.

A Yes sir.

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 Q And the trench itself
2 would never be less than 14 feet deep.

3 A Yes sir.

4 Q And the 14-foot depth
5 would only be the case where the water is greater than
6 ten feet deep.

7 A Right.

8 Q Can you tell me what --

9 THE COMMISSIONER: Excuse me,
10 the last point, Mr. Gibbs? Let me take a note of that.

11 MR. GIBBS: That the trench
12 will never be less than 14 feet deep and it will be
13 14 feet deep only where the water is greater than ten
14 feet deep. So if the water is shallower than ten
15 feet, the ditch will be proportionately deeper than
16 14 feet.

17 THE COMMISSIONER: Yes.

18 A Yes sir.

19 MR. GIBBS: Q Can you tell me
20 what the average depth of the ditch will be across
21 Shallow Bay from the bottom of the water to the bottom
22 of the trench?

23 A Oh, 16-17 feet will be
24 a good average, Mr. Gibbs.

25 Q And Dr. Clark has said
26 that you use a four to one side slope for the ditch.

27 A Well, we looked at that
28 again and we think that three to one would be
29 conservative.

30 Q Mr. Williams, can you

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 just change it over night? I thought you came here to
2 talk about the cross-delta. Yesterday Dr. Clark says
3 four to one, and now he's shrunk it to three to one.

4 WITNESS CLARK: I didn't say
5 we used four to one. I said our initial assumption was
6 four to one. Since then there's been a test pit dug
7 in the delta and it stands at much steeper slopes than
8 four to one.

9 Q So the four to one you
10 gave me yesterday is not something I should rely upon
11 to determine the ditch configuration?

12 A I think the context in
13 which you put the question was what was our first
14 assumption? At least that's the way I interpreted it.
15 Before we had done the test drilling in Shallow Bay
16 and this last test pit that was done by Northcan, we
17 were assuming four to one. But now that we have the
18 results, we've changed that.

19 Q And now you're assuming
20 three to one.

21 A As Mr. Williams says,
22 that's quite a conservative assumption.

23 Q Well, sir, have you done
24 a study to determine that you can achieve that angle
25 of repose under those water conditions?

26 A That was one of the major
27 purpose of the test pit that was dug there last summer.

28 Q And having dug the test
29 pit and got the soil conditions in it, it's a kind of
30 mathematical calculation.

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 A I'm sorry, I didn't
2 follow that.

3 Q After you've the soil
4 conditions and the -- underneath the water, to develop
5 the angle of repose, you do some kind of mathematical
6 calculation. Is that correct?

7 A Well, we do laboratory
8 tests to determine the angle of internal friction of
9 the soil, plus we have the field observation.

10 Q And do those tests exist
11 in the form, or do those results exist in the form of
12 a report that can be examined?

13 A Not to my knowledge.
14 Our input on the test pit was to take measurements.
15 The actual digging of the pit, the logistics, was
16 handled by Northcan and I'm not sure if they have
17 produced a report. We have laboratory test data, but
18 not in the form of a report yet.

19 Q Well, who calculated
20 that you could achieve an angle of repose of three
21 in one?

22 A It's not a calculation,
23 there's a field measurement.

24 Q Well, who determined it?
25 Someone must have made the determination. Who did it?
26 Who told you that it would be a three to one side
27 slope?

28 A I don't remember speci-
29 fically. We had field observations plus the test
30 data we have from soil samples, and it was collectively

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 arrived at that three to one was a conservative
2 assumption.

3 Q Well, where did you get the
4 number from, Dr. Clark, the three to one?

5 WITNESS WILLIAMS: He got it
6 from me, Mr. Gibbs. As he says, a test pit was dug,
7 some observations were made of the -- what happened
8 to the side slope over a period of time. They stood
9 up very well. I'm just suggesting for the calculation
10 that you want to make, that three to one is a conserva-
11 tive assumption based on that information.

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Gibbs

1 Q I want to know where
2 you got the three to one figure then. Did you work it
3 out or did someone tell you?

4 A Well I just explained
5 that the test pit that was dug at Shallow Bay was
6 observed and it was observed to stand at side slopes
7 in the range of two to one or steeper. I'm just saying
8 that for the calculation that you want to come up with,
9 that three to one is a conservative estimate.

10 Q No sir, I --

11 A If you want to go on the
12 test pit basis, use two to one.

13 Q I don't want to get into
14 an argument with you, but I want to put it to you this
15 way; that the amount of time that's going to be taken
16 in the dredging and the amount of backfill you're
17 going to require are both determined in part by the
18 slope on the trench at the bottom of the bay.

19 A Yes sir.

20 Q Therefore, the -- whatever
21 that slope will be in reality is critical to your con-
22 struction timing and to your costs.

23 A Oh, it's -- no, I wouldn't
24 call it critical, Mr. Gibbs. If it got -- if it was
25 found that it was ten to one instead of three to one,
26 that would be a critical change or a critical --
27 additional amount of material that would have to
28 excavated but our observations from the test pit and
29 the -- Dr. Clark's work on the core samples in the
30 -- in Shallow Bay would indicate that that's not going

Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Gibbs

1 happen; that it's not ten to one. That three to one
2 is a conservative estimate.

3 Q Well Mr. Williams, we're
4 frankly extremely skeptical that you can get an angle
5 of repose of three to one of what Mr. Hollingshead has
6 said is clay and silt, under a water body which is
7 going to be moving, and that's why I asked you upon what
8 it was based, because we would like to see that. We
9 would like to see the results of the excavation and the
10 work or studies or calculations which developed the
11 three to one number. Can you produce those?

12 A In time, I would think
13 we could.

14 Q In what kind of time?

15 A I don't know what form
16 the Northcan information is in. Dr. Clark might be
17 able to respond to the second part.

18 WITNESS CLARK: We've done
19 slope stability analysis of the side slopes based on
20 the test data that we have to determine the factor of
21 safety. We've taken account of change in pore pressure
22 due to wave action and we also have the measurements
23 that were made in the field. These are in work sheet
24 form now and we can produce that in fairly short order--
25 in a matter of days.

26 Q Through you to your
27 counsel, will that be done?

28 MR. MARSHALL: We can produce
29 that material for you.

30 MR. GIBBS: If the Foothills

Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Gibbs

1 skepticism about the three to one slope has some basis
2 in reality after looking at these materials, will these
3 people be produced for further examination?

4 MR. MARSHALL: Well I think
5 that's something you might raise at the time Mr. Gibbs
6 and we can deal with it then.

7 MR. GIBBS: Well, no sir.
8 The purpose of this cross-examination is to test the
9 reality of these bases and because the slope stability
10 is so serious, so important, in my submission, if those
11 results don't stand up in our view to a critical
12 examination, my friend should undertake to have these
13 people who rely on that angle of repose back, to go into
14 it.

15 MR. MARSHALL: Well, I don't
16 see any difficulty Mr. Gibbs.

17 THE COMMISSIONER: It seems
18 to me the matter is an important one and if the material
19 is produced and you wish to cross-examine these witnesses
20 further, I can't imagine not allowing you to. So, I
21 think we can leave it there for now.

22 MR. GIBBS: All right sir.

23 Q Then Mr. Williams, I want
24 again to confirm the width of the bottom of the trench.
25 Yesterday Dr. Clark gave the figure of I think 36 feet
26 but finally Dr. Hollingshead zeroed in on 20 feet.

27 WITNESS WILLIAMS: For the
28 calculation 20 is a reasonable number. It's again
29 conservative, Mr. Gibbs.

30 Q Where does the 20 feet

Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Gibbs

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16
- 17
- 18
- 19
- 20
- 21
- 22
- 23
- 24
- 25
- 26
- 27
- 28
- 29
- 30

come from? How do you determine that?

Cooper, Hollingshead, Williams,
Manning, Clark, Purcell
Cross-Exam by Gibbs

1 A That's an engineering
2 judgement.

3 Q Based on what?

4 A Based on experience,
5 the evaluation of what the potential problems are at
6 the particular site, both with respect to the material
7 that's being excavated and the manner in which it's
8 being excavated.

9 Q And did Dr. Hollingshead
10 make this determination that 20 feet was ^{an} experience
11 based ditch floor width?

12 A Well, I think it was a
13 joint decision, with --

14 WITNESS CLARK: There's another --
15 pardon me, there's another engineering consideration.
16 At the outset, before we had any tests, we assumed that
17 the area had a potential for liquifaction, and
18 liquifaction doesn't just affect the pipe. In case of
19 a seismic event, if the soil were to liquify, the
20 entire frost bulb would want to rise. So that was the
21 reason we had the gravel in there, and the quantity of
22 gravel was determined to load the frost bulb sufficiently
23 so that it would not rise under liquifaction; and that
24 had a bearing on the width of the bottom of the ditch.

25 Q Were you part of the
26 group that determined that 20 feet was appropriate?

27 A As I recall, yes, we had
28 the calculations of the amount of load required to
29 prevent pipe movement in the event of liquifaction was
30 done by the geotechnical group.

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Gibbs

1 Q Well why did you give me
2 a figure of 36 feet yesterday?

3 A I don't think I mentioned
4 36. I mentioned quite a few numbers and at the time
5 I said I was going from memory, that I could check it,
6 and I believe that the number that I came up with as
7 I could best recall was about 25 to 30 feet.

8 Q And you used the number
9 40 feet, I believe.

10 A At one time, yes, I
11 mentioned that I thought it was around 40 feet. Now,
12 in checking it, it's 20 feet.

13 Q And you're satisfied that
14 that's the right number?

15 A Well, particularly now
16 that all of the testing has indicated that it's very
17 unlikely that the soil will liquify.

18 Q And the 20 feet is because
19 as I understand it, of the frost bulb and the need to
20 get the gravel in to keep the pipe down.

21 A That had a bearing on the
22 size, and I don't recall precisely how it was arrived
23 at.

24 Q And, Mr. Williams, what
25 experience do you have in that kind of circumstance
26 that helps you to determine that you need a 20 foot
27 width?

28 WITNESS WILLIAMS: Well, I'm
29 not sure that I follow the last conversation. You said
30 that 20 feet was derived from the gravel backfill

1 problem? I don't think Dr. Clark is saying that now.
2 He said that in the -- that when -- they thought there
3 was a potential liquifaction problem, due to seismicity;
4 that some amount of gravel was required around the pipe.
5 Now their more recent determinations show that probably
6 that -- that that problem doesn't exist; that probably
7 it doesn't have to be backfilled with gravel; so then
8 the 20 feet boils down to now, to a construction
9 judgement.

10 Q All right sir. Does the
11 same ditch configuration, that is, depth below water,
12 or bottom of water, width at the bottom of the trench,
13 and angle of repose apply to the other three major
14 channels: West Channel, Middle Channel, and Langley
15 Channel?

16 A Well I think each situation
17 is probably unique depending on velocity and perhaps
18 Dr. Hollingshead has some information on what the
19 excavation quantities are based on, on the other
20 channels.

21 Q Well, Dr. Hollingshead,
22 does the same configuration apply to the three other
23 major crossings?

24 WITNESS HOLLINGSHEAD: The
25 depths of the ditch are going to be significantly
26 different in each case, but I would presume that the
27 bottom width is probably about the same in each case,
28 the side ^{slope} should be, certainly no less than three
29 to one.

30 Q Did you do excavation

Cooper, Hollingshead, Williams,
Minning, Clark, Turcott
Cross-Exam by Gibbs

1 in any of the other three major crossings to assist
2 you in determining the side slope of those three?

3 A No, there were no
4 excavations made in the other channels, similar
5 material can be expected to stand at a similar slope.
6 Flow velocities are roughly the same.

7 Q The ditch depth will not
8 be the same, I think you're saying.

9 A That's right.

10 Q All right, how will --
11 what will be the depth of the ditch in the West Channel?

12 A We have not done a
13 preliminary design at the West Channel location, so
14 I can't answer that question at this time.

15 Q You don't know what the
16 ditch depth is going to be there, then?

17 A We could look at it and
18 perhaps make an estimate --

19 Q Yes sir, but you don't
20 know now what it will be?

21 A At this time I cannot
22 tell you precisely what the ditch depth will be at
23 West Channel, no.

24 Q All right, what will the
25 ditch depth be at Middle Channel?

26 A It varies, from one side
27 of the channel to the other.

28 Q But do you have no formula
29 such as you had with Shallow Bay, of 10 feet below the
30 bottom of the channel, or twenty feet below the top of

1 the water, whichever is the greater?

2 A No, our designs with
3 respect to those other channels are not based on those
4 sorts of -- those comparable numbers.

5 Q Can you tell me what the
6 average ditch depth will be, from the bottom of the
7 water to the bottom of the ditch across Middle Channel?

8 A We could probably estimate
9 an average depth for you in due course, but it varies
10 significantly from one side of the channel to the other.
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 Q Can you tell me now what
2 it will be?

3 A No, not
4 in a matter of minutes. I can refer you to the prelimin-
5 ary designs which have been available for some time in
6 the exhibits and in this report that you have access
7 to.

8 Q And do those tell you the
9 ditch depth from the bottom of the water to the bottom
10 of the trench?

11 A Yes sir.

12 Q And what is it at its
13 deepest point, and what is it at its shallowest?

14 A I could give you those
15 numbers, Mr. Gibbs, but it might take a few minutes,
16 if you want accurate numbers.

17 Q I thought you said you
18 could take them off that profile.

19 A I can, but rather than
20 just give you one that's a rather small scaled-down
21 version and without the benefit of some straightages
22 to line up the elevations on each side of the drawing
23 it might take a few minutes, and if you wanted a better
24 answer we could go to the topography, which is in another
25 report, and we could give you a reasonable -- a good
26 answer to the question, given a few minutes at a break
27 or something like that.

28 Q All right.

29 A I can go through that
30 exercise now, if you want to wait five minutes.

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1
2 Q Give it to me after the
3 coffee break.

4 A Very good.

5 Q And similarly with
6 Langley Channel.

7 A Yes sir, and you wanted
8 the minimum --

9 Q And maximum.

10 A -- and maximum depths.

11 Q Yes, and an average if
12 you can develop it.

13 A That might take a little
14 bit longer.

15 Q I'll be content with the
16 minimum and the maximum. Now Mr. Williams, I'm told
17 that Langley Channel you have a water depth of as
18 much as 90 feet. Can you confirm that?

19 WITNESS WILLIAMS: The
20 about
21 maximum water depth there is/70-75 feet, as I recall,
22 at the crossing.

23 Q And at that maximum
24 water depth, taking your 75 feet, will we have still
25 a trench of ten feet deep?

26 A In the maximum water
27 depth, yes, to be the cover at the bottom, you know.

28 Q Making a depth of
29 about 85 feet below the surface of the water.

30 A Yes.

 Q And then the bank rises
 adjacent to the water, some number of feet.

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 A Yes.

2 Q How high?

WITNESS HOLLINGSHEAD:

3 A Sorry, you wanted the
4 height of the bank above the water level?

5 Q Yes.

6 A It's of the order of
7 four or five feet, something like that. Four feet,
8 threefeet.

9 Q So that brings us up to
10 89, say 90 feet from the top of the bank if you
11 measure horizontally, to the bottom of the trench.

12 A Yes. Excuse me, Mr.
13 Gibbs, except that the trench doesn't remain at that
14 depth right over to the bank. This is where you
15 get into difficulties.

16 Q Doesn't that mean that
17 on the bank on the approach to Langley Channel you're
18 going to have an excavation of somewhere in the range
19 of 80 feet deep?

WITNESS WILLIAMS:

20 A No.

21 Q What will be the deepest
22 depth of the excavation on the bank adjoining Langley
23 Channel as you approach the deepest water depth?

24 A Well, if you're looking
25 at the profile, Mr. Gibbs, the deepest depth of ditch
26 doesn't occur near the bank, it's ^{out} in the stream some
27 distance.

28 Q Yes.

29 A It appears that the deepest
30 part of the trench there will be in the order of 70-75

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 feet.

2 Q Yes, and what angle of
3 repose do we use for that 75 feet of trench in the
4 bank?

5 WITNESS HOLLINGSHEAD:
6 I don't recall
7 the number that was used in the calculations immediately.
8 I think we have that somewhere near at hand, but it's
9 certainly not going to be any flatter than what we
10 assumed at Shallow Bay, I wouldn't think.

11 Q Are you suggesting that
12 it can be three to one in the bank?

13 A It may well be. It may
14 well be steeper than that.

15 Q As I recall your geo-
16 technical prepared evidence for the National Energy
17 Board where concern is expressed about the stability
18 of slopes greater than three degrees. Now doesn't
19 that apply when you come to dig a trench across
20 Langley Channel?

21 WITNESS CLARK:
22 A That three degrees slope
23 is a permafrost slope, not below water. It's a frozen
24 slope or a thawing slope.

25 Q But isn't it in the bank
26 that you're excavating? Isn't that permafrost?

27 A No, also it's long-term
28 stability.

29 Q You're going down 75
30 feet so you're going through permafrost and doing it
in the summertime, and aren't you concerned, Dr. Clark,
at basing your calculations on a three to one angle
of repose in that 75-foot hole in the bank?

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Gibbs

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

A Not for short term
stability no.

WITNESS WILLIAMS: And it's
not in permafrost.

Q Is it not penetrating
permafrost?

A No. Not where we're
talking about the deepest trench -- the deepest part
of the trench in the crossing, Mr. Gibbs, which isn't
at -- which is not at the shoreline.

Q I know that.

A At the shoreline, it's
substantially shallower than that.

Q Mr. Williams, you've told
me that on the bank on the adjacent to Langley Channel
nearest to the deep water, the trench will be about
75 feet deep on the bank.

A I certainly did not. I
said just the opposite, that the deepest trench was
farther out in the stream.

Q Well then sir, I'm sorry
I misunderstood you. What--

A Why not get the profile
and look at it and then we're talking about the same
thing.

Q Because you're not having
much success reading the profile and I'll have less.
Now surely you can tell me what will the depth of the
trench be in the bank as you approach Langley Channel

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Gibbs

1 where the deep water is?

2 WITNESS HOLLINGSHEAD: It
3 would be at the order of ten feet; probably ten, 15
4 feet.

5 Q Then you're going to
6 bring your pipe along at about ten feet deep and then
7 you're going to bend it and go down under the channel.
8 Is that what you're going to do?

9 A Yes sir.

10 Q It's your evidence that
11 on the onland portion adjacent to Langley Channel, the
12 depth of the trench will not exceed ten feet.

13 A I'm not prepared to say
14 that it will not exceed ten feet without looking a little
15 bit closer at these preliminary designs. I say it's of
16 the order of ten to fifteen feet, I think is what I
17 said.

18 Q Well, my good advisor
19 here points out to me that there's a least one instance
20 where it's 35 feet.

21 A Well, I'd like to take
22 some time to look at the larger scale drawings and I
23 quite frankly don't see 35 feet at the bank, sir.

24 Q Will you do that at the
25 break period and tell me afterwards?

26 A That was part of the
27 exercise I was going to do for you anyway.

28 Q Thank you. Mr. Williams,
29 I'm informed that when you add up the distance across
30 each of West Channel, Middle Channel and Langley Channel,

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Gibbs

1 that the total comes to about $3\frac{1}{2}$ miles. Could you
2 confirm that?

3
4 WITNESS WILLIAMS: The total
5 horizontal length of those --

6 Q Yes, of the pipe crossing
7 -- of the crossing points of those three channels.

8 A It sounds low, Mr. Gibbs.
9 I think Shallow Bay -- Did you --

10 Q No, not including Shallow
11 Bay.

12 A I'm sorry.

13 THE COMMISSIONER: $3\frac{1}{2}$ miles
14 excluding Shallow Bay for those major crossings in the
15 delta.

16 A That sounds reasonable,
17 yes.

18 MR. GIBBS: So that the total
19 horizontal distance of channel crossings including Shallow
20 Bay comes to about eight miles.

21 WITNESS HOLLINGSHEAD: I think
22 we said -- I think we've said seven point something or
23 other in the evidence.

24 Q Rounding it off as Mr. Scott --

25 A Seven point one.

26 Q -- to eight.

27 A No, rounding it off to seven
28 probably.

29 THE COMMISSIONER: I
30 put down $7\frac{1}{2}$.

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Gibbs

1
2 MR. GIBBS: I am right in this
3 understanding, am I, that it's only those four channels
4 which will be dredged?

5 WITNESS WILLIAMS: On the
6 Prudhoe Bay leg, on the cross-delta route that
7 discussing, yes.

8 Q Yes, and the other 30
9 channels and five ponds or lake that you referred to
10 in your evidence will be crossed in winter construction
11 by the same means as any other above water construction?

12 A Yes sir.

13 Q Can you tell me what the
14 trench depth will be -- the average depth across the
15 delta for those portions other than the four major
16 channel crossings?

17 A Oh, on the -- on the land
18 area where we're talking about other than the -- other
19 than the other small -- small streams to cross.

20 Q All right, if there's a
21 difference, let's have the two of them.

22 A Well, across the flat --
23 flat -- flat spots, the depth ditch would be a minimum
24 of eight feet with -- that's four feet of pipe and four
25 feet of cover. It would get a little higher than that
26 in some of the -- some of the smaller channel crossings.

27 Q In the whole of that
28 crossing, leaving out the channel crossings, the pipe
29 will be below water table level when it's in the trench,
30 will it not?

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Gibbs

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

A I'm sorry, would you --

Q It would be below the
level of the water table --

A Where?

Q -- that's bedded in the
trench.

A When it's bedded in the
trench?

Q Yes.

A Well, not all year round,
I don't think, Mr. Gibbs. If you're talking about --
we're talking about the surface elevation of the main
channels or the channel through the delta. Some of
those -- some of those channels have bank heights of
about ten feet I think at low water. At high water,
certainly, the whole thing is below water level, in
spring flood season.

Q So it will be, depending
on time of year, it will be above or below water level.

A Yes.

Q In those times of year
when it's above -- I'm sorry, below the water level,
you anticipate, I take it, that there may be floatation
problems?

A Certainly the potential
is there, yes.

Q Yes. To control in part
at least, those floatation problems, I see in exhibit
266 which is the cross-delta supply lateral filing,

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Gibbs

1 under tab -- blue tab 8-B, "Design and Capacity of
2 Facilities", page 20. Do you have that, Mr. Williams?

3 A Under the tab 8-B, is it?

4 Q 8-B, "Design and Capacity
5 of Facilities", page 20.

6 A Yes sir.

7 Q Last paragraph, speaking
8 about the crossing of the under -- the underwater
9 crossings and the floatation problem that you expect
10 to resist floatation by a layer of gravel placed on top
11 of the pipe. Now, I presume I'm right in saying that
12 you will do similarly on the overland portions where
13 you're concerned with floatation--you'll resist it
14 by a layer of gravel on top of the pipe.

15 A Are you referring to
16 the second last -- second and maybe the last sentence
17 in that paragraph?

18 Q Well, I'll read it.
19 Halfway through the statement -- this statement occurs:

20 "Moreover, the pipeline will be weighted throughout
21 the proposed underwater crossings and will be
22 chilled so that a frost bulb will be established
23 around the buried pipe -- buried pipeline. Due to
24 the weighting in the frost bulb, the tendency of
25 the pipe to float because of liquifaction of the
26 surrounding unfrozen soil, is significantly
27 reduced. During the period prior to start-up of
28 the pipeline system, floatation will be resisted
29 by a layer of gravel placed on top of the buried
30 pipe".

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Gibbs

1 Now my question is, is that the technique that you'll
2 use to resist the floatation in the overland portions
3 that you've just agreed could occur when the water is
4 -- the pipe is below water level?
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 A No, sir.

2 Q How will you resist the
3 floatation on those pours?

4 A The cost estimates reflect
5 either the use of concrete weighting or frost anchors
6 throughout the buried land section of the line.

7 Q Then you don't propose
8 to use any gravel backfill at all on the overland
9 portions of the cross-delta route?

10 A The context of the gravel
11 here was because of the potential liquifaction problem
12 in underwater crossings, and in particular Shallow Bay,
13 across the land it is permafrost, Mr. Gibbs, and there
14 is no potential liquifaction problem across the land
15 sections.

16 Q I thought you said there
17 was a potential floatation problem.

18 A Yes, but not liquifaction.

19 Q I see, so it follows then,
20 am I right, that you're not going to use any gravel
21 backfill on the overland portions of the cross-delta
22 route?

23 A I wouldn't say "not any"
24 Mr. Gibbs, but very little. There may be some require-
25 ment for a small amount of gravel for bedding and
26 padding. I don't think a great deal. There may be some
27 required for drainage and erosion control at specific
28 sites. But not massive amounts of gravel for backfill.
29 We'll be mainly using the excavated material for backfill.

30 Q Now how do you propose

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 Mr. Williams, to construct the non-channel crossing
2 portion of the cross-delta route? The over-
3 land and the minor channels and the ponds, how are
4 you going to dig the ditch?

5 A With a trench machine.
6 This material is, by comparison to other permafrost
7 areas, is fairly easy to excavate. A large ditching
8 machine, in my opinion, would eat that up.

9 Q And have you tried a
10 ditching machine in that kind of permafrost?

11 A In very similar material,
12 Mr. Gibbs, at Sans Sault, yes.

13 Q And is that the ditcher
14 that you've been experimenting on for some years?

15 A No sir, not the one we
16 used at Sans Sault. It was an earlier generation,
17 smaller than the ones that are available now, less
18 horsepower, and it successfully excavated frozen
19 silt at a production rate.

20 Q And is that a conventional
21 ditcher such as is used in the southern pipelining in
22 Southern Canada?

23 A We're talking now about
24 the one that was used at Sans Sault?

25 Q No, about the one you're
26 going to use in the cross-delta route.

27 A I'm satisfied that the
28 largest machines that are available and have been used
29 now could successfully trench the land portion of the
30 cross-delta route. Now, by the time of construction

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 we expect that a newer generation machine will be
2 developed and in operation, which will be larger in
3 respect to horsepower and ditch depth capability than
4 the ones that are in existence now.

5 Q But isn't the problem
6 with the teeth on the ditching mechanism, isn't that
7 the real serious problem? Not the power of the machine
8 but it's ability to stand up to abrasion and so on it
9 encounters in digging through that material.

10 A That's one of the problems.
11 I don't know if it's the biggest one, Mr Gibbs, but
12 in the past 18 months we feel we've come a long way
13 in ditcher teeth design and metallurgy, a vast improve-
14 ment over what's been used before.

15 Q Sir, and have you
16 developed yet and have in use yet teeth that will stand
17 up for any length of time to this kind of work?

18 A Yes sir.

19 Q And that's the research
20 you've been doing on your ditch-digging machines?

21 A Yes.

22 Q Is that research financed
23 in part by Federal Government grant?

24 A I really don't know, Mr. Gibbs.

25 Q Who is conducting it?

26 A Mainly Northern Engineer-
27 ing has been doing work for Canadian Arctic Gas, on the
28 development of teeth. We have some outside consulting
29 help, namely J.E. Rymes out of Calgary, and we're also
30 working with teeth manufacturers about six or seven

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 manufacturers of teeth.

2 Q Well, is there any
3 Federal Government research grant coming in through
4 via Northern Engineering Services? Or Rymes or
5 others for this purpose?

6 A I'm reasonably sure that
7 there's none coming into Northern Engineering Services.
8 I'm not certain about Canadian Arctic Gas.

9 Q Do you have a report on
10 the present status of the art of these teeth in this
11 ditch-digging machine you propose to use?

12 A No, not a comprehensive
13 report.

14 Q Are reports prepared
15 internally? Or in Northern Engineering Services to
16 explain how the developments are proceeding on the
17 ditch-digging research? A Yes, particularly by
18 Rymes. Some of this work is being done with the tooth
19 manufacturers. It is of a confidential matter between
20 Rymes, Northern Engineering, and the tooth manufacturers.

21 Q And what is the most
22 recent report you have?

23 A Well, Rymes puts out a
24 monthly report, monthly progress report, so I guess
25 the most recent one was maybe a week or two old.

26 Q And are you prepared,
27 Mr. Williams, to produce the last 12 of the monthly
28 progress reports on the research and reports on the
29 ditch-digger?

30 MR. MARSHALL: Mr. Commissioner,

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 I suppose this gets into an area that all of us
2 anticipated we would reach at some point or other, with
3 respect to the production of documents. It seems to
4 me -- and I want to get specific instructions on this
5 point -- that we're really into an area where Foothills
6 is asking to have the benefit of some very expensive
7 research and development work that's been conducted.

8 MR. GIBBS: That's not the
9 case.

10 THE COMMISSIONER: At any
11 rate , you're suggesting there's a type of privilege
12 based on proprietary interest. Mr. Gibbs is seeking
13 to demonstrate, I suppose, that whatever the research
14 that has been carried out so far, it doesn't establish
15 that you've got a machine capable of digging across
16 the delta.

17 MR. GIBBS: Exactly, sir.
18 What's going to have to be done, it's going to have
19 to be blasted.
20
21
22
23
24
25
26
27
28
29
30

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Gibbs

1 MR. MARSHALL: With respect
2 to the production of these reports, I would like to
3 get some instructions as to whether or not Arctic Gas
4 wishes to take the position that they are proprietary
5 and they do not wish to have them produced. I believe
6 I could get those instructions during the course of
7 the day; but I think for the moment I'd like to defer
8 an answer to Mr. Gibbs in that last question, if I may.

9 WITNESS WILLIAMS: In my
10 opinion the report does demonstrate that that type of
11 soil is capable of being ditched with a wheel type
12 ditcher is included in the Sans Sault ditch testing
13 report, which is available to everyone, and in the
14 library, and what not.

15 THE COMMISSIONER: Well you
16 rely on that, you say that that demonstrates that you
17 can cross the delta with a ditcher of the current
18 generation, so to speak. You're not dependent on the
19 new technology.

20 A The Sans Sault ditching
21 was done with a generation machine older than what's
22 available now. It's my opinion that an engineer can
23 take that report with that information, knowing what --
24 knowing the mechanics of the machine that was used there,
25 and the mechanics of the machines that are in existence
26 and usable now, and come to the conclusion that the
27 newer machine would not have a great deal of difficulty
28 ditching the land section of the cross delta route.

29 Q Well, we're dealing with
30 three generations. The past generation, which is the

1 machine in use at Sans Sault; the current generation;
2 and a new generation of machines that you said will be
3 coming onstream when you're ready to build.

4 A Yes. That last one has
5 now been built yet.

6 Q Right. Now the old
7 machine that was used at Sans Sault, you're not
8 suggesting it could ditch the trench across the delta?

9 A Yes, I am suggesting that
10 it could ditch quite a bit of it. Maybe not at the rate
11 that we would like, but yes, it would ditch a fair bit
12 of it, in my opinion.

13 Q Well the remainder -- are
14 you suggesting the remainder could be ditched by the
15 current generation of machines?

16 A Yes sir.

17 MR. GIBBS:
Well I take it that

18 Mr. Marshall is still going to obtain his instructions.

19 THE COMMISSIONER:
Oh yes.

20 MR. GIBBS: And in your
21 planning, Mr. Williams, you've discounted entirely the
22 technique of blasting, for the trench across the
23 cross-delta.

24 A In the delta portion
25 itself, Mr. Gibbs, I don't think it will be necessary,
26 except at the approaches to two stream crossings, where
27 the ditch machine can't operate. I can see that there
28 will be some blasting required there, but for the
29 mainland section, no, I don't think it will be necessary.
30 In my -- that's my opinion.

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Gibbs

1 Q For all of your cost
2 estimates, and your logistics planning, you have gone
3 entirely on the basis that the ditch digger will be
4 usable to excavate the trench on the overland portion?
5 Other than those cross approaches?

6 A Well, the plan yes, but
7 for cost purposes, the spreads do have in the large
8 backhoe -- backhoes, I'm sorry -- that would be required
9 for approach to stream crossings.

10 Q Yes, but aside from the
11 approaches to the stream crossings, you discount any
12 need, and your plan is not based on any intention of
13 blasting the trench on the overland portion?

14 A Yes sir.

15 Q Witness, now be equipped
16 with the Marshall letter of March 8, 1976, and he has
17 it, and would you look, Mr. Williams, at the first
18 in that letter, the first map accompanying that letter.
19 The number on the map is IK-0251-1001.

20 A Yes sir.

21 Q And I want you to look
22 particularly at the column on the right hand side
23 entitled "Borrow in Cubic Yards". Do you have that?

24 A Yes sir.

25 Q And you'll note that the
26 total for spread B is 2,730,000 cubic yards.

27 A Yes sir.

28 Q And spread B embraces
29 almost all of the cross-delta route.

30 A Yes sir.

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Gibbs

1 Q And 2,730,000 cubic yards
2 is the figure that Miss Minning inserted in line 2 of
3 her testimony yesterday.

4 A Yes.

5 Q In place of the previous
6 figure of 2,364,000 cubic yards. Is that right?

7
8 WITNESS MINNING: Yes.

9 Q Where did the figure of
10 2,364,000 come from?

11 WITNESS WILLIAMS: The previous
12 number, Mr. Gibbs, was when Station CD-08 was located
13 in the delta, near Middle Channel; included that mile
14 and a half of access road from the wharf site to the
15 station site. It's changed now that the station has
16 been moved to Tununuk Junction, which has a station pad
17 and an airstrip.

18 Q But it has the effect,
19 as I see it, when you change the station to Tununuk
20 Junction, of increasing the gravel requirements by
21 366,000 cubic yards.

22 A Yes, that's due to the
23 airstrips.

24 Q Oh, I see. At Tununuk

25 Junction. / Q In looking at this table last night with
26 my handy little calculator, it seemed to me that you
27 had established a uniform depth of ten feet of gravel
28 for the compressor station pads and work pads. Is that
29 right?

30 A Yes sir. In the delta

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Gibbs

1 section.

2 Q Yes, we're talking about
3 the delta.

4 A Yes sir.

5 Q And the uniform depth for
6 the airstrip of three feet.

7 A We're still talking about
8 the delta?

9 Q About the airstrip shown
10 on that Borrow column.

11 A Well if we're talking
12 about "B", the only one referring to I think is the
13 one at Tununuk Junction, now.

14 Q Yes.

15 A And I don't think, I
16 think it's substantially more than three feet.

17 Q I see. Why the ten feet
18 for the compressor station, and work pads and wharves
19 and so on?

20 A Well, the work pad and
21 wharves, and the compressor station, the ten feet was
22 selected to get the surface elevation well above the
23 spring and summer flood levels.

24 Q And then all of the
25 installations down in the delta, you conclude, ten
26 feet elevation is safe to keep it above water level?

27 A That's our opinion, yes.

28 Q And that's the reason
29 for using the ten foot depth.

30 A Yes sir.

Cooper, Hollingshead, ¹⁹⁸⁷⁵Williams,
Minning, Clark, Purcell
Cross-Exam by Gibbs

1 Q Then I look at CA-06,
2 which is also on that -- CA-07 I guess it is -- also
3 on that gravel in Spread D, and saw that there you used
4 the gravel depth -- I'm sorry, CA-06, the first one
5 under Spread D -- of about 7½ feet.

6 A Well, I'm not sure how
7 you would arrive at the depth of 7½ feet, Mr. Gibbs.
8 You could be right. I don't have the number here with
9 me, the average depth, but that --

10 Q Well CA-06 is up out of
11 the delta, so you don't need the same 10 foot gravel
12 depth.

13 A Right.

14 Q And so there; I beg your
15 pardon?

16 A Depending on the terrain,
17 of course, and these are estimates. There haven't been
18 detailed field surveys at the sites done, to take in
19 account the topography, the topography is taken off
20 aerial photographs; and it's a good estimate but it's --
21 you know, it has it's limitations too.

22 Q I'm told, Mr. Williams,
23 that in some of those kind of gravel uses, not where you
24 have to stay above water level, but where you don't have
25 that concern; you can use a sheet of styrofoam and --
26 on the surface of the ground -- and then put the gravel
27 on top and cut your gravel requirement by as much as
28 50%. Does that sound right to you?

29 A That's -- I know that's
30 what Alyeska is doing on the North Slope, but I think

1 it'd be fine for the short term -- short term work
2 period. I'm not sure about the long term period. It
3 may be.

4 Q Have you given any
5 consideration to doing that in the interests of
6 conserving gravel?

7 A Yes, we do have some
8 drawings that do illustrate that alternative, in one
9 of the reports, Mr. Gibbs, yes.

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 Q Have you adopted that
2 technique?

3 A No, not at this time, no.

4 Q Is it under consideration
5 there will come a time when Arctic Gas will either
6 tell you "Yes, use that technique, " or "No, you're
7 not to use it."

8 A I'm sure that decision
9 will be made in time, yes.

10 Q And when do you expect
11 that to be made?

12 A I have no idea, sir.

13 Q It also then follows
14 that you have really no idea how much gravel you're
15 going to need.

16 A I think the numbers that
17 we've shown here are maximum. There are alternatives
18 available to reduce them, if that's found to be
19 feasible and economic.

20 Q Look at that column again
21 and confirm, if you can, that the volume of gravel
22 which you have on that table for Shallow Bay granular
23 backfill is based on filling the entire trench or
24 both trenches of the configuration that was given
25 yesterday.

26 A Can you answer that?

27 WITNESS CLARK: No, it's not.
28 That amount of gravel was determined on the basis
29 of the load required on the pipe to prevent liquifa-
30 ction when the frost bulb had reached the depth to

Williams, Purcell, Hollingshead
Minning, Cooper, Clark,
Cross-Exam by Gibbs

1 which it is assumed that liquifaction would occur.

2 Q And it's then a coinci-
3 dence that that amount of gravel will fill both of
4 those trenches.

5 A I don't believe it will.
6 It won't come close to it.

7 Q Perhaps you and I will
8 compare our calculators at the coffee break. That's
9 the way I worked it out last night, Dr. Clark, it
10 seemed that it would fill it exactly; but you disagree
11 with me.

12 A Certainly when we made
13 the analysis, the configuration we used at that time
14 would not fill the trench, not in the deepest portions.
15 The tests that we have done on liquifaction potential
16 have pretty well convinced us that gravel will probably
17 not be required.

18 Q Also I notice from that
19 column, Mr. Williams, that there is no granular
20 requirement for what we just talked about, bedding,
21 padding, or any backfill of the overland portions.
22 That would have to be added.

23 WITNESS WILLIAMS: Yes, that's
24 correct, Mr. Gibbs. In the borrow quantities that
25 are shown on the strip maps and the borrow quantities
26 that we have shown in tables, for instance in the
27 direct testimony yesterday, the borrow quantities
28 shown there are the ones that you can take off the strip
29 maps and add them up and you come to the quantities
30 shown in the table. That does not include gravel

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 required for such things as bedding, padding, drainage
2 and erosion, ^{control} slope stability and in Miss Minning's
3 testimony from time to time she has said that in addi-
4 tion to the quantities you can add up from the strip
5 maps here, there is something in the order of six
6 million, an additional six million yards required
7 north of 60 to take care of these situations that are
8 impossible to calculate with any degree of certainty
9 at this time.

10 Q Yes sir, but dealing with
11 the cross-delta route and this table, what has to be
12 added is something for bedding, padding, and some back-
13 fill for overland portions, although you can't tell me
14 what the number is.

15 A Right.

16 Q And something for use
17 on the other channel crossings.

18 A Yes, at the banks.

19 Q And some for the manu-
20 facture of concrete coating to use for the weighting.

21 A Yes sir.

22 Q And the bank stability
23 which you refer to.

24 A Yes sir.

25 Q All of those quantities
26 whatever they may be, have to be added to that table.

27 A Yes sir.

28 Q And I take it there is
29 no basis or no number that you can give to me which
30 should be added for that table for the cross-delta route.

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 A No, all that I can say is
2 that it's included in that overall rough estimate of
3 an additional six million yards.

4 Q I also note from that
5 table that there is none necessary for roads except
6 for very short lengths. At the bottom of spread B,
7 a road of 3,000 feet, and a little way up, a road of
8 32,000 feet.

9 A Yes.

10 Q And then up in spread
11 F, a road of undetermined length but it's going to
12 take seven acres , and those are all the roads that
13 you see necessary on the cross-delta portion, are they?

14 A Those roads are, I'm pretty
15 sure , mainly between airstrips and compressor station
16 sites.

17 Q But sir, the Alyeska
18 technique has been, has it not, to use both a gravel
19 road and a gravel work pad?

20 A Yes sir.

21 Q And have you calculated
22 the gravel requirements which you will have if you
23 go to that technique of using a gravel work pad
24 and a gravel road?

25 A Across the delta?

26 Q Yes.

27 A No sir.

28 Q And why not?

29 A Because we don't propose
30 to use that technique.

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
C ross-Exam by Gibbs

1 Q Because it's your conviction
2 tion that you can get by without using it.

3 A Yes sir.

4 Q Before leaving that table,
5 on borrow requirements, could I just ask you, Mr.
6 Purcell, there is shown on the table as a borrow
7 requirement a block valve. For example, on spread
8 F, block valve .23 acres, 2,000 cubic feet. Do you
9 see that?

10 WITNESS PURCELL: It's on
11 spread E and it's 2,000 cubic yards.

12 Q That's right, 2,000
13 cubic yards.

14 A Yes sir, I see that.

15 Q But as I recall your
16 evidence before the National Energy Board, Arctic
17 Gas has now dropped the plan to use intermediate
18 block valves.

19 A No sir, I never said
20 that.

21 Q Then the recommendation
22 has been made that they will not use intermediate
23 block valves.

24 A No sir, what I told you
25 was that intermediate block valves were in the plan
26 because at the time the plan was drawn up they were
27 required by the construction codes, the Canadian
28 Standards for^{gas} pipeline construction. At the present
29 time the code is silent. They are not required by the
30 code, and we have not made a decision as to whether or
not to take them out or leave them in.

Cooper, Hollingshead, Williams
Minning, Clark, Purcell,
Cross-Exam by Gibbs

1 THE COMMISSIONER: Well so
2 they're in, if you don't make the decision?

3 A Yes, sir, they're still
4 in. The decision has not been made to take them out.

5 Q Sorry, I --

6 A And I don't -- my personal
7 opinion is that it's not a terribly important issue.
8 There's no point in making a decision on it at this
9 time.

MR. GIBBS:

10 Q Well, it's a cost decision
11 isn't it, and I had been of the impression that the
12 decision had been made to take them out or a recommenda-
13 tion had been made to drop the block valves.

14 A Not that I'm aware of,
15 Mr. Gibbs, no sir.

16 Q Well, whether or not the
17 block valve stays in, you will need also some type of
18 valve arrangement at Milepost 336 to regulate the flows
19 through the two 36 inch pipelines, won't you?

20 A Yes, there will be an
21 arrangement there to allow you to cut off the flow
22 to either pipeline.

23 Q That will have to be some
24 kind of valve arrangement?

25 A Yes sir.

26 Q Would it be of a size and
27 structure similar to a block valve?

28 A Yes, it contains block
29 valves.

30 Q So that even though you've

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Gibbs

1 moved the compressor station over to Tununuk Junction,
2 you'll still have some kind of gravel and borrow
3 requirement there because of the valve installation?

4 A Well now you've moved on
5 me, haven't you? We were on Milepost 336?

6 Q Yes.

7 A I don't work out these
8 gravel details. I suspect that might included in the
9 work pad that is required in that area. The valve
10 might be in that area, I don't know.

11 Q Can you tell me that,
12 Mr. Williams?

13 WITNESS WILLIAMS: Certainly
14 gravel would be required at that valve site, yes.

15 Q Will that be an addition
16 to what's on the table?

17 A Not necessarily, Mr. Gibbs.
18 At the end of construction, there will be a surplus of
19 gravel there from the work pads and we would see using
20 that material from the work pads at the end of con-
21 struction for backfill at the edges of the channel for
22 other uses. There will be surplus of gravel there and
23 in this case, it'd be close to this valve arrangement.

24 Q It's then in this category
25 you may need an additional -- there may be additional
26 gravel requirements^{for it} or there may not?

27 A Yes sir.

28 Q Mr. Purcell, with respect
29 to those two 36 inch lines, starting at Milepost 336, is
30 the plan to operate both at once, or only one at a time?

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Gibbs

1 WITNESS PURCELL: I would
2 think you would leave them both open; operate them both.

3 Q Well, is it -- is that the
4 plan to do that? To operate both at the same time?

5 A There have been discussions
6 in the past for geotechnical reasons, it might be
7 desirable to operate them alternately, but I think that
8 concern is evaporated and it would certainly be more
9 desirable to leave them both open so that the pressure
10 drop through the lines would be less and the downstream
11 fuel requirement would be reduced.

12 Q The effect of that will
13 be to produce, to maintain across the channel crossings,
14 two frost bulbs, one around each 36 inch pipeline?

15 A Yes, I assume that's true.

16 Q Alternating the use might
17 reduce or even eliminate some of that frost bulb
18 effect?

19 WITNESS CLARK: It would reduce
20 the size of the frost bulb. It wouldn't eliminate it.

21 Q Yes.

22 THE COMMISSIONER: It would
23 what?

24 A Reduce the size of it.

25 Q And it wouldn't what?

26 A Would not eliminate it
27 entirely.

28 MR. GIBBS: In your view, Dr.
29 Clark, is it preferable to have the two full sized
30 frost bulbs, or smaller ones by alternating the use of

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Gibbs

1 pipeline -- the 36's.

2 A If the soil were highly --
3 it had a potential for a great amount of heave, it
4 would be very likely preferable to have a smaller frost
5 bulb. But the tests that we have conducted to date
6 indicate fairly low shut-off pressures, in that frost
7 heaving can be limited to within tolerable amounts by
8 the depth of the burial that we've proposed. So the
9 technique of alternating use of the two lines isn't
10 planned here.

11 Q Were those tests field
12 tests or laboratory tests or office calculations?
13 What were they?

14 A Laboratory tests

15 Q Mr. Williams, can I come
16 back now to the item I mentioned earlier of gravel road
17 and work pad for overland construction. Aren't there
18 two instances where that might be required? Firstly,
19 if ice or snow roads or work pads -- ice or snow roads,
20 or ice or snow work pads, can't be used, then you'd
21 have no alternative but to use gravel?

22 WITNESS WILLIAMS: I can't
23 visualize that happening, Mr. Gibbs. But in a hypo-
24 thetical question, I guess the answer is yes.

25 Q The second instance would
26 be if it turned out that you had to do the cross-delta
27 construction in the summer rather than in the winter.
28 You'd have to use gravel.

29 A Yes, I think that follows.
30

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Gibbs

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

Q In either of those
instances, Mr. Williams, the gravel requirements would
be hundreds of thousands of cubic yards more than are
shown on the table on drawing IK-02511001?

A Yes sir. Millions,
probably.

Q I beg your pardon?

A Probably millions.

Q Yes.

THE COMMISSIONER: Well,
maybe we should adjourn for coffee now for a minutes.

(PROCEEDINGS ADJOURNED at 10:50 A.M.)

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Gibbs

1 (PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

2 THE COMMISSIONER: Well, let's
3 come to order.

4 MR GIBBS: I think sir, Mr.
5 Marshall has some pronouncements to make.

6 MR. MARSHALL: Mr. Commissioner,
7 I've contacted Arctic Gas. There are indeed some
8 proprietary agreements relating to the work being done
9 on ditcher teeth development. We appreciate that
10 Mr. Gibbs is interested in the question of whether of
11 not the teeth are going to work or not, and what's
12 really going to be required because of these agreements,
13 they'll have to try to sort out what is covered by
14 them and what is not, and give Mr. Gibbs what is not
15 covered by the agreements, and if that satisfies him,
16 then presumably that's the end of the matter. Mr.
17 Williams can undertake that work when he gets back to
18 Calgary, and it won't be until he starts getting into
19 it that I can give Mr. Gibbs an indication of when
20 we'll have the materials in his hands.

21 MR. GIBBS: All right sir, it
22 being understood of course that if we're not satisfied
23 with what we get, we may ask that it all be put before
24 you to determine whether in fact there is a privilege
25 attached.

26 MR. MARSHALL: Yes, that's
27 perfectly understood.

28 MR. GIBBS: There was a matter
29 outstanding from yesterday, sir, on the length of time
30 it was going to take to dredge across Shallow Bay on

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Gibbs

1 one crossing, and could we have that time on the
2 record now, please?

3 WITNESS WILLIAMS: Yes sir.

4 If we consider a cross-section that has a 20 foot
5 bottom, we're talking about Shallow Bay now, three to
6 one side slopes, and an average depth of 16 to 17 feet;
7 each crossing of Shallow Bay would require the
8 removal of about a million yards of material. The
9 dredging equipment that we have considered in our
10 cost estimates is based on information received from
11 Sceptre Dredging, and in particular a 36 inch dredge
12 which they are using. This is the type of equipment
13 we have in the plan. 36 inch dredge is rated at
14 5,000 cubic yards per hour. We would plan on running
15 this equipment about 20 hours a day, with the other
16 4 hours for shift change and routine maintenance. So
17 theoretically, the dredge is capable of excavating in
18 the order of 100,000 yards per day, per 20 hour working
19 day.

20 If we de-rate that 100,000
21 yards to take care of adverse weather conditions that
22 may occur, for repair, and come to an average of
23 60,000 yards per day, the excavation of one crossing
24 of Shallow Bay would require about 17 days, on a very
25 conservative estimate.

26 Q Thank you. And
27 Dr. Hollingshead, you are going to give me some
28 information?

29 WITNESS HOLLINGSHEAD: Yes sir,
30 just to follow up on that. You asked about minimum and

Cooper, Hollingshead, Williams,
Manning, Clark, Purcell
Cross-Exam by Gibbs

maximum depths of ditch in the other crossings, in the delta. We've got those figures. I would just like to say that we've taken them from the rather smaller versions of the exhibit drawings which are scaled down and found in this report, entitled "The Preliminary Design Of Four Major Water Crossings In The Cross-Delta Pipeline Route". The figure should be taken as approximate.

However, starting with the north arm of Reindeer Channel, or what has sometimes been referred to as Middle Channel, first of all the upstream crossing, we're looking at a minimum depth of 18 feet, and a maximum depth in the order of 38 feet.

Q Could I interrupt a minute? That's of trench, or below water surface?

A These are trench depths.

Q Minimum of 18 --

A Minimum of 18, maximum 38. On the downstream crossing, of north arm Reindeer, a minimum of 18, and a maximum of about 35.

THE COMMISSIONER: That's the -- from the surface of the water to the bottom of the trench. Sorry, Mr. Cooper is shaking his head.

A No, not necessarily the surface of the water sir. This would be the ditch depth.

THE COMMISSIONER: You mean --

A From the bed level to the ditch bottom.

Q You mean from the bottom

Cooper, Hollingshead, Williams,
Manning, Clark, Purcell
Cross-Exam by Gibbs

1 of the channel to the ditch bottom?

2 A It may not necessarily
3 be at the bottom of the channel though; we've tried to
4 give them the maximum depths, which invariably occur
5 as you're coming up a bank, so it wouldn't coincide with
6 the bottom of the channel, but it doesn't necessarily
7 coincide with the water level either. It would be
8 the maximum ditch depth, coming up that bank. It would
9 be in the order of 38 feet.

10 With respect to Langley Island
11 Channel, the upstream crossing, the minimum depth of
12 ditch would be about 10 feet -- sorry -- probably about
13 15 feet, there's a 10 foot cover and that is at the
14 bottom of the channel; a ditch depth of 15 feet. The
15 maximum is about 75 feet, and at the banks the depths
16 are 18 to 20 feet.

17 For the downstream crossing,
18 the minimum would be about 30 feet, the maximum is
19 60 feet, and at the banks, it's about 15 feet.

20
21
22
23
24
25
26
27
28
29
30

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 THE COMMISSIONER: Well, just
2 pausing there. I want to make sure I understand where
3 we are. Langley crossing is the deepest crossing, I
4 think you said that yesterday. Do you say that the
5 upstream crossing of Langley Island Channel that you
6 will have a trench extending 75 feet from the bottom
7 of the channel to the bottom of the trench. at your
8 maximum depth on the crossing?

9 A For the upstream
10 crossing of Langley Channel, there is one point on
11 that particular cross-section wherein the ditch depth
12 would be in the order of 75 feet, and this occurs
13 at approximately station 132 where the --

14 MR. MARSHALL: Do you have
15 that report?

16 THE COMMISSIONER: No, I'm
17 just looking at this map attached to your letter.

18 MR. MARSHALL: I think it
19 might be clearer if he could show you the drawings.

20 THE COMMISSIONER: The point
21 that Mr. Gibbs is concerned about presumably isn't
22 just a question of how deep you go; it's sort of the
23 bend in the pipe across the channel, I suppose, among
24 other things -- many other things. Well look, I just
25 want to make sure I understand you, that's all, and --

26 A Well, the configuration
27 of that particular cross-section is that there is a
28 relatively deep section in the channel which has about
29 75 feet of water.

30 Q Yes.

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 A The pipe is going down
2 essentially below that lowest point, and at that lowest
3 point there would be about ten feet of cover over the
4 pipe, so we're looking at a ditch depth at that point
5 of about 15 feet, 14 to 15 feet.

6 Q What's the width of the
7 Langley Channel?

8 A Oh, I believe it's about
9 4,000 feet.

10 Q About a mile, eh?

11 A Something less than a mile.

12 As you come up the slope from that low point in the
13 channel on the east side or the right bank, you come
14 up a fairly steep slope and the pipe isn't going to
15 follow that steep climb, and when you get to the top
16 of that sort of steep slope you're going to have
17 something like a 75-foot deep ditch. Having come up
18 that slope, then to the right as I'm looking at this
19 drawing, to the right or to the east of station 132,
20 the channel bottom levels off, we're still below water,
21 and for the last several hundred feet of the channel
22 proceeding in an eastward direction we're in sort of
23 a flat where the water is very shallow, so we come up
24 from a deep hole, if you like, up a steep slope, onto
25 a kind of a flat shallow portion of the channel. It's
26 just as you come to the top of that sort of steeper
27 portion of the right-hand slope that you get this
28 maximum depth of 75 feet.

29 Q Forgive me, Mr. Gibbs.

30 Let me just pursue this for a moment. You have elected

Williams, Purcell, Hottel
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 -- when I say "you" I mean Arctic Gas -- you have
2 elected to alter the prime route so as to cross the
3 delta. That means you increased the number of major
4 crossings, you've more than doubled the number of
5 major crossings that you have to cope with from an
6 engineering and environmental point of view, when
7 earlier you changed the route to avoid a major crossing
8 of the Liard. So you've gone ahead and done all of
9 this, you've got this -- these new crossings, including
10 this, what appears to be altogether unique crossing
11 of Shallow Bay to contend with. Would you not as
12 engineers have preferred in all respects to stay with
13 the prime route around the delta and to have avoided
14 crossing the delta?

15 A No sir, I don't think so.
16 Just speaking on behalf of the river crossings portion
17 of it, or maybe we can go back one, in general the
18 route is shorter and therefore a lot cheaper.

19 Q Well no, but leaving
20 aside financial considerations, you're engineers, you're
21 not financiers.

22 A As far as the crossings,
23 speaking for the crossings, by going across the delta
24 we have for one, avoided a very difficult crossing
25 at Point Separation, and our observations --

26 Q O.K., you've exchanged
27 one for four, though, haven't you?

28 A Well, that may well be a
29 fair guess at the ratio, but the observations at Point
30 Separation over the last three or four years indicated

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 that there was potential for ice jamming and associated
2 difficulties at that crossing.

3 Q Well, excuse me, let me
4 interrupt you. In electing then to cross the delta
5 was one of the reasons you did that to avoid having
6 to cross the Mackenzie at Point Separation?

7 A I wouldn't say that it
8 was one of the reasons necessarily. I think that fell
9 out. That certainly followed.

10 Q That was a beneficial
11 fall-out.

12 A That's right. With
13 respect to the crossings, if I can just get back to
14 that one point, is that although there are more of them,
15 they are a very much lower gradient stream if you like,
16 and much less troublesome and much less difficult in
17 terms of a potential scour problem.

18 So although there are more
19 of them, they don't, in our view they are not a problem,
20 the same sort of problem that you have on, for instance,
21 the main stem of the Mackenzie or the Liard.

22 Q Well, I understand your
23 problem with ice at Point Separation, because you've
24 got the whole of the ice flow coming down that one
25 channel, and it is presumably distributed among these
26 other channels, so --

27 A That's right, and at
28 breakup the ice, as we've said in the direct evidence,
29 essentially sits there and rots in situ, it's not pushed
30 around with any great force by the channel currents,

Williams, Purcell, Hollingshead, Minning, Cooper, Clark
Cross-Exam by Gibbs

1 it's moved as much probably by the wind as it is by
2 the water, and the fans just can't generate the extensive
3 damage you know on the vedder banks. It's really in
4 a weakened condition, it's sitting more or less
5 stationery and rotting in situ. The currents are
6 significantly lower and therefore the water crossings
7 are simply not the same problem, although there are more
8 of them.

9 THE COMMISSIONER: All right.

10 Well, sorry, Mr. Gibbs. Carry on.

11 MR. GIBBS: We had one more
12 channel to deal with, I think.

13 A Well, we gave you north
14 arm of Reindeer and Langley. You've got the good words
15 on Shallow Bay, or did you want --

16 Q I have the Shallow Bay,
17 yes.

18 A Which other one --

19 THE COMMISSIONER: You can
20 give me Shallow Bay, if you don't mind, just to make
21 my little chart here complete.

22 A I think at Shallow Bay
23 we're looking at a minimum of 14 feet and a maximum
24 of about 30 feet.

25 Q Upstream and down-
26 stream?

27 A Yes sir, they're essen-
28 tially the same. Was there another one?
29
30

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1
2 Q I thought we had
3 four of those.

4 A Well, West Channel, I
5 think you mentioned at one point, and we don't have --

6 Q Oh, West Channel.

7 A -- a preliminary design
8 at West Channel.

9 MR. GIBBS:

10 Q You have nothing to offer
11 at all on West Channel?

12 A I don't believe we have
13 a complete cross-section there at the pipeline crossing,
14 no. We have some data that's in one of the reports
15 but it indicates that the general depth of West Channel
16 is about 15 feet. 10 to 15 feet.

17 Q And when are you going to
18 provide those maximum /minimums for West Channel?

19 WITNESS WILLIAMS: We don't
20 have any proposed field programs at this time, Mr. Gibbs,
21 to determine that information, and the reason it hasn't
22 been done to date is that it is a fairly small channel
23 compared to the others and it's not that difficult.
24 We don't plan to get that detailed information in the
25 immediate future, no.

26 Q Then you don't plan to
27 furnish anything upon which to make any judgment or
28 form an opinion on slope stability, bank stability and
29 so on in the West Channel crossing?

30 A No, we didn't plan to do
that.

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

WITNESS CLARK: Mr. Gibbs, with

regard to slope stability, you expressed some concern about the three to one slopes. It might be useful to draw your attention and perhaps your advisors to the bottom profile data that is in the report that Dr. Hollingshead is referring to, and define natural scour holes that are quite well profiled, standing at slopes much steeper than three to one.

Q Can we come back now, Mr. Williams, to the question of roads? First of all I want to start with a statement in the evidence, your evidence attached to Mr. Marshall's letter of March 15, 1976, and on page 5 there is this paragraph:

"The requirement for water has been reduced substantially due to research and studies completed in snow and ice road construction, it is now estimated that considerably less water will be required than we thought at the time of filing."

Do you see that paragraph?

WITNESS WILLIAMS:
A Yes sir.

Q Does that statement apply to the cross-delta route?

A Yes sir.

19899

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross Exam by Gibbs

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

Q How much is substantial
in terms of the cross-delta portion?

A The statement was written
with respect to the total project, Mr. Gibbs. I think
if you compare those -- the new water numbers given in
the table to what was in the filing, you'll find that
they are reduced and it's for the total area and those
water requirements in the bulk of them are -- the bulk
of the water shown in those requirements is for the
manufacture of snow, where thought necessary. The other
quantities are for camps and ditch flooding and testing
and --

Q But I don't recall those
tables as being broken down sufficiently that you can
pull out a number for the cross-delta portion which is
what the Inquiry is now dealing with.

A I think you're right. I
don't think that can be done --

Q You can --

A From what you have.

Q You can't advance to the
Inquiry a volume of water that is going to be required
under your new calculations for the cross-delta route?

A I don't have that with
me. I think it could be obtained from our work papers
in Calgary.

Q Well, you have to have
that number, of course, for your construction planning
and for your costing.

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Gibbs

1

A Sure.

2

3

4

Q And it's not in any of
the filed material. That is, separated out just for
cross-delta.

5

6

A If you're talking about
the delta section alone, you're right.

7

8

Q Yes.

9

10

A The water quantity that's
shown in the sixth construction year wouldn't cover the
area from the Alaska-Yukon border to Tununuk Junction.

11

12

Q Yes.

13

14

A You might be able to infer
something from that quantity, Mr. Gibbs, but --

15

16

Q Can you break it out for
the delta portion alone?

17

18

A That could be done, yes.

19

20

21

Q Will you done that and
supply that number?

22

23

24

MR. MARSHALL: We can do that,
Mr. Gibbs. When you say the delta portion alone, do
you mean from Milepost 336 to Tununuk, or --

25

26

27

MR. GIBBS: No, I --

28

29

30

MR. MARSHALL: Just so we're
on the same basis.

MR. GIBBS: I thought we
entered the delta at about mile 320.

A Yes, I can do that.

THE COMMISSIONER: That's
an interesting question, that. I would be inclined to
think that myself. But where do you say the delta

Cooper, Hollingshead, Williams,
Manning, Clark, Purcell,
Cross-Exam by Gibbs

1 begins on this map?

2 A I would say around 320.

3 Q Yes. 320 to Tununuk, is
4 that -- that takes you to the other side of the --

5 A About 52 miles.

6 MR. GIBBS: That's what you
7 require then?

8 A Yes. On 320 to 372.

9 Q You can provide a water
10 number for that 52 miles?

11 A Yes sir.

12 Q When doing it, can you
13 break down in -- break it down in the amount required
14 for road and work pad construction?

15 A Yes.

16 Q And the amount required
17 for other uses, which I take it, is primarily camp use?

18 A Camp testing, ditch
19 flooding.

20 Q Yes. Will you break it
21 down then into those categories when you provide --

22 A Yes sir.

23 Q Now, sir, in your statement,
24 you refer to research and studies completed in snow
25 and ice road construction which enable you to reduce
26 your water calculations. Have those studies been
27 presented to the Inquiry?

28 A Yes, it refers mainly
29 to the Inuvik snow road study, Mr. Gibbs, that has been
30 filed and which was completed subsequent to the March

Cooper, Hollingshead, Williams
Minning, Clark, Purcell,
Cross-Exam by Gibbs

1 1974 filing.

2 Q But completed prior to
3 the opening of the Inquiry hearings?

4 A Yes. Certainly.

5 Q Well, when you say the
6 requirement for water has been reduced substantially;
7 reduced below what?

8 A Reduced from the quantities
9 shown in the March 1974 filing.

10 Q That's because you
11 determined in your opinion, that the Inuvik snow road
12 tests showed you needed less water than you'd first
13 estimated?

14 A That, and other observa-
15 tions that we have made, yes.

16 Q Well, what other observa-
17 tions do you have?

18 A Well, for instance, the
19 uses of snow fencing in areas like the delta that we're
20 discussing. The original -- the quantities -- water
21 quantities shown in the -- in the initial filing of
22 March 1974 were very conservative. We were feeling
23 our way at the time and didn't know exactly what the
24 quantities were going to be so we took a very conserva-
25 tive estimate of having to manufacture great, great
26 quantities of snow. Since that time, we don't think
27 that those great quantities will be required. Some,
28 certainly, will probably be manufactured but not to the
29 extent that we thought, taking the conservative approach
30 in the original filing. We think that those quantities

Cooper, Hollingshead, Williams
Minning, Clark, Purcell,
Cross-Exam by Gibbs

1 can be reduced substantially.

2 THE COMMISSIONER: I have
3 missed something, Mr. Williams. Why have you changed
4 your mind about that? Why do you think you won't need
5 as much as you thought you would at first?

6 A Well, the quantities
7 shown in the original filing were the worst case
8 situation where you had no snow and you had to manu-
9 facture snow for the complete length of the right-of-way
10 in sensitive permafrost terrain; a very conservative
11 approach. Now, we think that with snow fencing, with
12 hauling snow from lake surfaces, that the quantity of
13 water required for manufacturing snow can be reduced.

14 Q Yes.

15 A Instead of 60 to 70 miles
16 of snow manufactured per spread, we're now thinking in
17 terms of ten to 15 mile -- I'm sorry, ten to twenty
18 miles per spread required in the early part of the
19 season, and completing the rest of it either with
20 natural snow fall or snow hauled from lake surfaces.

21 Q Well, you think you'll
22 get it from natural snowfall that you will harvest by
23 snow fencing or hauling snow from lake surfaces.

24 A In the tundra area, I
25 would expect to get a very large percentage of it from
26 snow fencing. In the boreal forest area, the wind
27 doesn't accumulate the snow as well in that area, so
28 in that area there'd be more hauling snow from surfaces
29 or -- and manufacturing snow and the natural fallen
30 snow, but not too much drifted snow."

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Gibbs

1 Q Mr. Williams
2 During your construction
3 planning, you've looked quite a lot to the Alyeska
4 experience as a guide, on what can be done in winter
5 construction, particularly along the North Slope. Is that
6 right?

7 A No, our construction
8 plan was developed, Mr. Gibbs, before Alyeska got
9 started. We've certainly observed, witnessed and
10 looked at Alyeska at every opportunity, but I wouldn't
11 say that we used that as a guide to put together our
12 construction plan.

13 Q Well, you formed some
14 of your plans based on Alyeska experience because you
15 have no experience of your own to go by.

16 A Not in the original
17 filing. Maybe things that have happened on Alyeska
18 since they got started have caused us to think about
19 new things but --

20 Q Well sir, you told me before
21 this very Inquiry that the reason why you could work
22 in the cold and the dark was based on part of what
23 Alyeska had been able to do.

24 A Fine.

25 Q Don't you remember telling
26 me that?

27 A Sure.

28 Q And so in some respects
29 you've look^{ed} to Alyeska to see what can be done.

30 A Fine, I'm just saying that
 we didn't develop our construction plan on Alyeska's

1 work.

2 Q And one of the problems
3 on the North Slope of Alaska, is water source, is it
4 not?

5 A Yes sir.

6 Q And that's been a fairly
7 serious problem, water source for manufacturing snow
8 or ice roads.

9 A I'm not aware of any
10 snow manufacturing being undertaken on the North Slope.
11 I understand that in the spring of '74 -- I'm sorry,
12 '75, that there was a problem in getting sufficient
13 water in the Prudhoe Bay area, for their requirements.

14 Q Yes, and you expect to
15 encounter similar water problems in your Alaska supply
16 line, don't you?

17 A No, I think with proper
18 planning, Mr. Gibbs, that a lot of the problems that
19 have been experienced in the past can be overcome,
20 and we have had more recent studies done on water
21 availability on the North Slope, including Alaska, and
22 they are very encouraging. That report is in the
23 draft stage right now.

24 Q Well let me read you a
25 portion of the evidence of William H. Copeland,
26 manager of the North Central District Offices of the
27 Division of Lands in Alaska. The prepared evidence
28 given by Mr. Copeland before the Federal Power Commission.
29 This question is asked of him. "Is water supply
30 generally a problem on the North Slope?" And this is

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Gibbs

1 his answer, and I'm going to ask you when I've read it
2 to you to comment on it.

3 "Yes, especially in the winter season with low
4 snowfall. When there is little snow to insulate
5 the surface of lakes, and deep holes in rivers,
6 they freeze to a greater depth."

7 Do you agree with that?

8 A Yes sir.

9 Q

10 "This reduces the water available from them."

11 Do you agree with that?

12 A Yes sir.

13 Q

14 "To provide a water supply, operators quite often
15 place snow fencing perpendicular to prevailing
16 winds to collect snow at a water source. This
17 prevents deep freezing of the surface ice and
18 increases the available water." Do you plan
19 that?

20 A Yes sir.

21 Q And is that in your
22 construction plan, that you will have snow fences
23 around an adjacent to lakes and ponds to prevent
24 deep freezing?

25 A That procedure was not
26 included in the plan ^{as} filed. It has occurred to us
27 more recently, and before that testimony was written,
28 and I understand it has been tried and worked
29 successfully, and I think it's a good method of assuring
30 a water supply.

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Gibbs

1 Q Can I find that in any
2 of your filed material, that you plan to do that?

3 A No, I don't think you
4 could, Mr. Gibbs.

5 Q That's something you're
6 announcing now?

7 A Fine, if that's the way
8 you'd like to read it.

9 Q Then, Mr. Copeland goes
10 on to say,

11 "Many of the lakes freeze to the bottom , and
12 many of the rivers nearly cease to flow." And
13 you expect that to happen on the Alaska supply leg..

14 A Yes sir.

15 Q
16 "Water is often hauled several miles to the
17 point of use."

18 A Yes sir.

19 Q And you expect to have
20 to do that?

21 A Yes.

22 Q
23 "On the North Slope, water sources are being
24 developed by snow fencing, and by utilizing
25 existing lakes, either through insulating their
26 surface artificially, or through deepening
27 existing lakes, and then insulating their
28 surface." Now, do you plan to deepen any of the
29 lakes or ponds and insulate their surface?

30 A I would see insulating

1 the surface with snow accumulated through snow fencing.
2 I'm not sure about the deepening of ponds, Mr. Gibbs.
3 I think that's a good method for long term water
4 requirement, as is the case in Alyeska where -- I'm
5 sorry -- at Prudhoe Bay, where there will be substantial
6 numbers of people there for quite a few years. I think
7 that's a good method of improving their water supply
8 in that area for the long haul. I'm not sure that it's
9 applicable to the short term construction season
10 we're talking about.

11 Q And you don't then
12 propose to do it?

13 A Well, I wouldn't eliminate
14 it, but it's not in the plan.

15 Q Then the next question
16 is this, and you agree, I think you already told me
17 this. Question: "To your knowledge, has anyone ever
18 manufactured snow to construct snow roads on the
19 North Slope?" Answer: "No." So you have no experience
20 from Alaska to go on for the use of snow roads?

21 A On the North Slope?

22 Q On the North Slope.

23 That's right.

24 A That's right.

25 Q The next question is,
26 "Have snow fences been used on the North Slope to
27 collect snow?" And the answer is this,

28 "As I have explained, some snow fences have been
29 used on lakes to catch snow to insulate the
30 lakes so it would not freeze to the bottom.

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Gibbs

1 However, I am unaware of any use of snow fences
2 for the purpose of collecting snow for the
3 construction of snow roads." So that device of
4 using snow fences to accumulate snow for snow road
5 construction is not based on Alaska experience?

6 A Well, Mr. Copeland
7 may not have been aware that Alyeska did in the winter
8 of '75, '76, and in particular over the Christmas
9 period, install six miles of snow fence on their
10 right of way, in the vicinity of -- well it's the
11 camp south of Galbraith Lake.

12 Q How many miles south
13 of Prudhoe Bay?

14 A In the order of a hundred
15 miles, Mr. Gibbs. It's open tundra terrain, very
16 similar to the North Slope.

17 THE COMMISSIONER: Isn't that --
18 wouldn't that be well into the Brooks Range, or
19 beyond, by then. Would you still be north of the
20 Brooks Range?

21 A Oh yes.

22 Q You would?

23 A Oh yes, well north.

24 Q All right, I'm sure you're
25 right.

26 A Galbraith is in the
27 northern -- or in the foothills on the northern side
28 of the Brooks Range, and this was north, maybe I said
29 south, I mean north of Galbraith Lake at the -- near the
30 next camp. And they installed, as I say, six miles

Cooper, Hollingshead, Williams,
 Minning, Clark, Purcell
 Cross-Exam by Gibbs

1 of fence there -- snow fence around Christmas time,
 2 1975, and when we were there in late January of '76
 3 they had accumulated more snow than they could handle,
 4 and said that if -- my discussion with one of the
 5 Alyeska employees, he said that if they had it
 6 installed earlier they would have accumulated snow
 7 earlier. This was a particular section of the line
 8 where they didn't want to put in a gravel pad, but
 9 they wanted to, because of the high ice content of
 10 the terrain, they didn't want to put in a gravel pad,
 11 they wanted to use snow, and the snow fence collected
 12 it very well for them.

13 Q But you wouldn't say
 14 that 100, or 150 miles inland is precisely comparable
 15 with what you're going to face running along parallel
 16 to the coast.

17 A I would say it's very
 18 close, Mr. Gibbs, and something maybe even closer is
 19 the snow fencing work that's been done at Barrow, where
 20 fences -- I'm sure you're familiar with report by
 21 C.R.R.L., where snow fences were installed to accumulate
 22 snow to improve the summer belt and thereby improve
 23 their water supply at Barrow. Maybe that's closer to
 24 the Prudhoe Bay terrain than the area I'm talking about,
 25 but it's all very similar, in my opinion.

26 Q Well, I take from that ^{it}
 27 that you're confident that you can accumulate enough
 28 snow with snow fences?

29 A I can see the possibility
 30 of having a shortage in the early part of the

1 construction season, Mr. Gibbs, and this is why we've
2 estimated quite large quantities of water to be
3 required in the early part of the construction season
4 to manufacture snow. For the later period,,in the
5 tundra type terrain, yes, I can see, and I think, and
6 I feel, and I'm sure almost that snow fences will do
7 the job.

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
C ross-Exam by Gibbs

1 Q You're sufficiently unsure
2 that your plan is to build -- to manufacture 10 or 20
3 miles of snow per spread.

4 A That's included in the
5 estimate, yes sir.

6 Q Now, Mr. Williams, have
7 you identified the water sources for the water you're
8 going to need for the 53 miles of cross-delta?

9 A Oh no, no, we haven't
10 selected the areas. That's an area where I would
11 say we'd have our least problem getting water. There's
12 lots of it there.

13 Q Well, sir, whether there
14 is or is not lots of it there depends, as Mr.
15 Copeland says, on whether it freezes to the bottom.

16 A It's not a similar
17 situation at all, Mr. Gibbs. You can't compare the
18 water situation in the delta to Prudhoe Bay area.

19 Q Well then --

20 A The channels in the
21 delta are quite deep and a good percentage of them do
22 not freeze to the bottom. Some of the smaller ones do,
23 yes.

24 Q Do you expect then to just
25 go in indiscriminately and collect water wherever there
26 is open water, or will you be selecting precise
27 water sources?

28 A The precise sources will
29 be selected.

30 Q And the precise sources

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 then in turn govern your logistics, your cost of
2 transportation?

3 A I don't see that being a
4 major factor in the delta area.

5 Q When do you expect to have
6 the precise sources pin-pointed?

7 A Sometime prior to
8 construction.

9 Q And that's as close as
10 you can get?

11 A Yes sir.

12 Q And so that it's not
13 until sometime prior to construction that you know
14 what your construction costs are really going to be.

15 A Oh, we've taken a pretty
16 conservative approach, Mr. Gibbs, in the way of
17 equipment required to haul water. I think we're on
18 the fat side.

19 Q Well, how can you say
20 that when you can't tell me what volume of water
21 you're going to need, therefore how can you say that
22 you conservatively estimated the number of vehicles?

23 A I thought I agreed to
24 supply you with the volume of water needed from our
25 work papers in Calgary.

26 Q And then the number of
27 vehicles you're going to need will depend upon the length
28 of the haul, won't it?

29 A Sure.

30 Q And that will in turn

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 will depend upon the sources you use.

A Yes.

2 Q And those things you won't
3 know until sometime before construction.

4 A Not definitively. I
5 think we've done it enough -- done enough work in
6 that area to make an intelligent estimate.

7 Q But you are not prepared
8 to supply the facts upon which other people can make
9 their intelligent estimate.

10 A Well, Mr. Gibbs, it
11 gets back to the old question, I guess, of just how
12 much detailed engineering do you do for the purposes
13 of hearings and securing a permit. We think we've gone
14 to great lengths, much farther than anybody has ever
15 gone in the past with respect to pipeline applications.
16 I think that's a matter of detailed design that is
17 not that important in arriving at a reasonable cost
18 estimate.

19 Q All right, sir, if you
20 don't think that water sources are important, we'll
21 leave it there.

22 A Well, we're talking
23 about --

24 THE COMMISSIONER: Let's not
25 get into that.

26 A We're talking about the
27 delta now, I hope. We have identified some potential
28 water sources at other locations, but because there
29 is no much water available in the delta, I didn't
30

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 think that was a big deal.

2 MR. GIBBS: Now, Mr. Williams,
3 can we go to another part of this Alaska prepared
4 evidence to do with ice and snow roads? This again
5 is Mr. Copeland and I'm reading from his prepared
6 evidence, pages 4, 5 and 6. Again I'm going to ask you
7 to comment on this as we go through.

8 Q The question is this:
9 "What kind of snow or ice roads are used on the North
10 Slope and what has been the success of these
11 various roads?

12 "Answer: A winter road or winter trail is
13 a road constructed by bulldozing tundra to
14 form a road bed, or by laying a light layer of
15 gravel across the tundra. These roads can be
16 used only during the winter months when the
17 sub-base is solid. We do not authorize construction
18 or use of this type of road any more,
19 with the exception of existing trails and then
20 only during the winter months. These roads
21 are not permitted because their construction
22 either permanently damages or alters tundra."

23 Now, stopping there, I take it that you have no plan
24 in your cross-delta construction to use what Mr. Copeland
25 describes as winter road or winter trail?

26 A That's correct.

27 Q Then he goes on:

28 "A snow road is a trail of compacted snow
29 constructed of snow that was already in place
30 or snow that was hauled in trucks for some

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 distance."

2 That's what you propose.

3 A In part, yes.

4 Q

5 "These roads are generally for short duration
6 use, mostly by sleds or wheeled trailers pulled
7 by bulldozers."

8 And that's what you intend to use your roads for.

9 A In part, yes.

10 Q Well, for what other
11 purpose besides short duration use by sleds or wheeled
12 trailers and bulldozers?

13 A Well, it was just the
14 wheeled trailers that I got hung up on. Other wheeled
15 vehicles as well.

16 Q Then he goes on:

17 "On the North Slope most snow roads actually
18 used are trails that were a product of
19 rologon haul roads. Multiple passes of the
20 rologons with their smooth surface air-bag
21 tires compact existing snow along the route.
22 Drifting snow settles in these compressed
23 tracks and is compacted by subsequent
24 rologon passes."

25 And that's what you propose.

26 A In part, yes.

27 Q Well, how else are you
28 going to compact the snow?

29 A Well, that's a fairly
30 thin layer of snow that the author is talking about,

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 I think, Mr. Gibbs, and for a haul road, a snow haul
2 road we think you need more depth than that, and to
3 run a pulvamixer in it, for which you need at least
4 12 inches of snow, and secure the compaction and
5 consolidation of the road in that manner, rather than
6 a light-weight rologon. I don't think that that would
7 stand up to wheeled traffic very long.

8 Q He goes on to say:

9 "After several such cycles,"
10 that's rologon passes,
11 "an excellent snow road is formed. These are
12 then quite often utilized by North Slope
13 operators for other types of hauling, mainly
14 by sleds or wheeled trailers. It should be
15 pointed out, however, that these roads are
16 not usually not sufficiently formed to permit
17 use by other types of vehicles until the latter
18 part of the winter season, and after heavy
19 rologon use."

20 That's what you say, you've got to have more snow than
21 would come by the normal snowfall.

22 A Yes sir.

23 Q But he says there is
24 generally not enough snow at the beginning of the winter
25 season to construct a snow road and it takes consider-
26 able time to build up a rologon trail. Therefore at
27 the beginning of the season ice roads are more often
28 utilized. So if you're going to start your construction
29 season in, I believe your timing is early November or
30 late October, based on the Alaska experience, you're

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 not going to have enough snow to build a substantial

2 road.

3 MR. MARSHALL: Why don't you
4 ask him if he agrees with the statement you are putting to him?

5 MR. GIBBS: Well, I thought I
6 put a question mark at the end of that.

7 A What was the question?

8 Q All right, sir. Based
9 on the Alaska experience, am I right that you would
10 not expect to have enough snow at the beginning of
11 your proposed construction season of late October or
12 early November to build a substantial snow road?

13 A Oh, that doesn't neces-
14 sarily follow, Mr. Gibbs. It could be the case, it
15 would depend on the success of the snow fencing, which
16 would be installed prior to mid-October, say, if
17 we were fortunate enough to get an early snowfall with
18 some wind there would be lots of snow. I'm not saying
19 that that's the general case, and that's why we have
20 allowed for the manufacture of snow, to ensure an early
21 start.

22

23

24

25

26

27

28

29

30

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Gibbs

Q Then sir, if that's the case, you'll have to manufacture more than ten or 15 miles of snow.

A I don't think - I think we amended that to ten to twenty, Mr. Gibbs and --

Q Right.

A No, I wouldn't think so. I think that by the time you've constructed ten to twenty miles of pipeline that beyond that the snow fences will have accumulated sufficient snow to construct a road and move on.

Q Your plan really rests Mr. Williams, on your ability to manufacture snow in the required quantities, doesn't it?

A In the early part of the season.

Q Yes sir and the --

A We put -- we have put that in the plan.

Q The machine you propose to use for that purpose doesn't now exist, does it?

A The snow manufacturing equipment?

Q Yes sir.

A Oh, it's -- we've run some recent tests on new equipment, Mr. Gibbs and we think that they're very close to a production unit.

Q But you don't yet have in production the kind of unit that you say you're going to use to manufacture your ten to twenty miles of

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Gibbs

1 snow?

2 A I think that could be
3 done in a very short, short period of time.

4 Q Thank you.

5 THE COMMISSIONER: What could
6 be done? The machine could be got into production?

7 A Yes, a machine that's
8 capable of the production that would be required.

9 MR. GIBBS: But Mr. Williams,
10 the fact is that someone is manufacturing a machine
11 which you will then test to see whether it would
12 perform the job you want it to perform. Isn't that
13 the fact?

14 A No, just a month ago or
15 less than that, we did test a machine that's rated at
16 300 gallons per minute throughput of water in the
17 fairly mild weather in Edmonton. We were able to get
18 it up to 260 gallons -- I'm sorry, per minute not hour.
19 Per minute and convert 260 gallons of water per
20 minute into usable snow. I think that production rate
21 is adequate. There are some minor improvements that
22 can be made to that machine.

23 Q That's the machine you
24 call the production model that you're going to use?

25 A Yes sir.

26 Q It has, sir, a hose type
27 of discharge or like a sprinkler or both?

28 A The one that we tested
29 that we tested too -- or the one that we liked was
30 a combination air-water mix along with some straight

Cooper, Hollingshead, Williams,
Munnick, Clark, Purcell,
Cross-Exam by Gibbs

1 water spray. It's a combination machine.

2 THE COMMISSIONER: Do these
3 resemble in any respect the snow making machines that
4 they use at ski -- on ski slopes?

5 A The process is the same,
6 Mr. Commissioner, but the one that was recently tested
7 in Edmonton is substantially larger in its capability
8 than what you have probably seen on the ski slope. But
9 the process is very similar.

10 Q Well, the ones that I've
11 seen on the ski slopes don't seem to have an awful
12 lot of success in manufacturing snow. I'm not suggesting
13 I set the analogy to be drawn, but --

14 A In Vancouver and Calgary,
15 the weather is pretty mild and that's when the snow
16 is required on ski slopes and the efficiency does drop
17 off considerably with mild weather.

18 Q Would you have lots of
19 water in both of those places?

20 A That's not a problem.

21 Q It's just the climate
22 itself. The water won't freeze. That's really what
23 you're -- what the problem is in those places, is that
24 it?

25 A In Vancouver and Clagary?

26 Q Yes.

27 A The -- a combination of
28 the higher temperatures and the equipment itself.
29 Improvements have been made in -- very recently in
30 the equipment so it's a combination but you certainly

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Gibbs

1 need cold weather for production manufacture of snow.
2 You can do it at warmer temperatures, but the throughput
3 capacity has to be dropped.
4

5 Q Let me just go back a bit.
6 Mr. Gibbs is on a very important subject here and he
7 -- you and he discussed it last fall some time. You
8 told me then that originally, you felt the construction
9 season on the North Slope would be approximately from
10 the beginning of December to mid-April. Then you
11 advanced -- and you felt that would be a pretty tight
12 schedule. Then you advanced the construction season
13 by one month indicating that you felt you could get
14 underway late in October or early in November. That
15 gave you a certain amount of latitude and you breathed
16 a little easier in predicting that in three years of
17 pipe -- yes, well, in three years of pipelaying, you
18 could do all of this and that in one year, one winter;
19 you could build this thing from Prudhoe Bay -- or
20 at least from the Alaska border to wherever it was
21 you were going to join up.

22 It used to be Travaillant Lake,
23 but now it's Tununuk, I guess. But now you just told
24 Mr. Gibbs, maybe I didn't understand this before, that
25 to get that extra month -- the month of November-- to
26 work in the month of November, you have to manufacture
27 snow. You've indicated that that is essential because
28 that first ten to twenty miles of snow roads is something
29 that -- for which you must have -- you must be able to
30 manufacture snow. I have I got you right so far?

Cooper, Hollingshead, Williams,
Manning, Clark, Purcell,
Cross-Exam by Gibbs

1 A Very close sir, except
2 the last couple of sentences. I would hope that we
3 wouldn't have to manufacture any snow. If you're
4 fortunate to get an early snowfall on the North Slope
5 with some wind I feel that the snow fences will
6 accumulate sufficient that you wouldn't have to manu-
7 facture any. However, each and every spread that's
8 working on the -- that will be working on the North
9 Slope will have to be equipped with the suitable
10 equipment in the proper place ready to go to work in
11 the event that that early snowfall doesn't occur.

12 Q Right, and you told me
13 just a few minutes ago that originally you thought
14 you'd have to manufacture enough snow on the North
15 Slope to build 60 or 70 miles of snow roads per spread.
16 Now you think it's only ten, 15, or 20 miles of snow
17 roads per spread that you'll need to manufacture snow
18 for. You attributed that decline in the mileage that
19 -- of snow roads that you'd have to manufacture snow
20 for to -- and enhance capacity to collect snow through
21 snow fences and hauling snow from lake surfaces.

22 But if the snow isn't there
23 -- if you don't get that snowfall, then you won't be
24 able to collect it through snow fencing or through
25 hauling snow from lake surfaces and you'll wind up
26 having to manufacture enough snow for 60 or 70 miles
27 of snow roads per spread, not just ten or 15 and your
28 dependence on this new machine will be more or less
29 complete. Do you want to comment on that. I don't
30 want to be misrepresenting anything you've told me.

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Gibbs

1 That's why I'm expressing my understanding of --

2 A No the case -- the case
3 that you cited is correct if you don't get any snow,
4 ^{you} then either have to manufacture it all or shut down
5 and certainly the -- you'd manufacture it to the
6 extent that you're capable of. I would just like to
7 comment though when you said that originally, we thought
8 that the whole thing would have to -- we'd have to
9 manufacture snow for the whole spread. I don't think
10 I said that. I think I said that the water quantities
11 that we showed in the estimate were based on manufactur-
12 ing snow for those larger numbers of miles.

13 We were floundering a bit in
14 the research work at that time when the application
15 was written and filed, and we've done considerably
16 more work since then. When we did file the numbers,
17 we were certainly hoping that that would not be the
18 case, that we'd have to manufacture snow for the whole
19 section.

20 But, to be conservative, we
21 showed the -- we reflected quantities that would do that;
22 quantities of water.

23

24

25

26

27

28

29

30

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 THE COMMISSIONER: This is
2 vital because you're going to, in the first two years
3 of pipe-laying you're going to build the main stem from
4 the delta; and in the third year of pipe-laying you're
5 going to build the supply leg from Prudhoe Bay. It
6 you don't get that built in one year, your costs of
7 borrowing money will be increased very much because,
8 of course you'll be paying interest for an additional
9 year on some very large borrowings, I take it; but
10 what's important from my point of view is you'll be
11 -- you'll have another second construction season in
12 the delta and on the North Slope in building that
13 Prudhoe Bay leg. That's why we keep coming back and
14 it's no reflection on the your knowledge of the matter,
15 but we keep coming back because it is vital as to when
16 can you get started? Will it be on November 1st? Will
17 it be on December 1st? Or will it be possible to work
18 at all on the North Slope in December and January, or
19 will you not be able to build that Prudhoe Bay leg,
20 will you not be able to get under way until February
21 1st or thereabouts, as Foothills insists? That's a
22 vital question to this tribunal and it's a vital
23 question presumably to the National Energy Board, which
24 has to consider the whole question of cost of the
25 project -- the cost nationally, the cost in terms of
26 -- it's a vital question to the Americans, too, who
27 presumably want to build that thing in one season, not
28 two, to get their gas to the south.

29 Well, --

30 A Can I just go ahead?

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

Q Yes, go ahead.

A The facts are that a lot of work has been done in the northern area in the past five or six years in the months of November. There's a report by Muskeg Research Institute, for instance, that it did work with Gulf Oil on the use of rologons or early movement of equipment in the northern areas. I think the history is there, that it can be done. The only other thing I'd say is, as you pointed out, the North Slope work is scheduled for the 3rd or the third year of construction, the sixth construction year, and Arctic Gas will have obtained considerably more experience through their first two winters of construction. If they say that for some reason the schedule as now proposed is optimistic, there are remedial actions that can be taken for that last year of construction.

Q Well, from November 1st to December 1st you have a whole question: Can you build snow roads at that time? Will you have enough snow? If you don't have enough snow, can you manufacture enough snow? That's the question mark that surrounds the month of November, it seems to me. Let us assume that by December 1st you have your snow roads in place. The question mark that Foothills sought to envelope December and January with, was the question, will it be too cold and too dark for equipment to function effectively, for men to work along the North Slope and of course on the cross-delta route during those two months, December and January? Or will you really be

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
CROSS-Exam by Gibbs

1 forced to wait, as Foothills says you will, until the
2 beginning of February to work along the North Slope and
3 to cross the delta? That's where the two companies have
4 clashed, and it's an issue of great importance.

5 Were they working along the
6 pipeline route from Prudhoe Bay south to the Brooks
7 Range throughout the months of December and January?
8 Were they working at full bore along that route in
9 December and January, do you know, Mr. Williams?

10 A Not the Alyeska 48-inch
11 pipeline system was not going full bore during those
12 months, certainly not. There was considerable gather-
13 ing work done, smaller diameter pipelines done by
14 Bannister and Houston Contractors on the North Slope
15 in those months, they worked through Christmas, Houston
16 Contractors did. When we were there in late January
17 the temperature on the slope was plus 20 degrees Fahren-
18 heit, which is unseasonably mild. The gas line,
19 the small diameter gas line that's being constructed
20 from Prudhoe south to pumping station 4, was -- there
21 was some work done on it in December and they were
22 starting again in the latter part of January when we
23 were there constructing the gas line.

24 Q Well, constructing the
25 gas line?

26 A The small diameter gas
27 line.

28 Q Right, right.

29 A Parallel to the Alyeska
30 system.

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 Q Well, were the welders,
2 though, in December and January, welding 48-inch pipe
3 on the North Slope in Alaska?

4 A I don't think so.

5 Q Was that because it was
6 too cold, or was it because the welders union was not
7 prepared to allow its members to work in the cold and
8 the dark, or a combination of those things?

9 A No, Alyeska have a fairly
10 restrictive tie-temperature, that they can't tie in
11 buried pipe, when the ambient temperature is -- oh,
12 I've forgotten -- is, you know, the buried pipe is, --
13 when the ambient temperature is plus 20 degrees Fahrenheit
14 and the above ground pipe, I think it's minus 10 degrees
15 Fahrenheit, so with those restrictions they wouldn't
16 be able to work, at least histori^{cally} wouldn't be able to
17 work too many days in those months.

18 They were installing work
19 pads, gravel pads and installing vertical support
20 members during that period, except that most of the
21 contractors took a fairly extended Christmas break
22 from about mid-December to at least mid-January with
23 the exception of the crews that were installing the
24 oil gathering lines at Prudhoe Bay. Some of them
25 worked, Houston Contractors, for instance, worked
26 through Christmas.

27 THE COMMISSIONER: Sorry, I
28 just wanted to -- all right, we'll adjourn till two.

29 (PROCEEDINGS ADJOURNED TO 2 P.M.)
30

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

(PROC EEDINGS RESUMED PURSUANT TO ADJOURNMENT)

MR. MARSHALL: Mr. Commissioner,
I would like to file a table that was in Mr. Williams' evidence on the fourth page, it's entitled:

"Estimated quantities of the natural resources required in the construction of the proposed pipeline."

I've just extracted from his prepared evidence the table, and I'll leave it with Miss Hutchinson for marking as an exhibit.

MR. GIBBS: Q Mr. Williams, can we talk a bit more about your snow-making machine? The discussion so far has concentrated on snow roads, but if you have to manufacture snow, of course you'll have to do it also for the work pad, won't you?

WITNESS WILLIAMS: Yes sir.

Q And so you've got 60-foot widths of work pad, and what for the road, 40 feet?

A I've got some of those quantities worked out. Taking into consideration the 120-foot right-of-way, we have 30 feet of snow road 18 inches deep, it's calculated that 21,000 barrels of water per mile are required. For the remaining 90 feet of working area, with nine inches of snow requires 32,000 barrels per mile.

Q And I take it you propose to supply your snow-manufacturing machine with water by using trucks.

A Oh, that's possible, and probable in some areas. If it can be piped to the

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 machine, that's another possibility.

2 Q You then, I take it you
3 don't know now whether trucks will be used or pipe or
4 a mixture of both.

5 A Our cost estimate reflects
6 the use of trucks, Mr. Gibbs, if pumping through a
7 temporary pipeline can be used, it would be done.

8 Q And for your cost
9 estimate how long a haul did you calculate for each
10 truck?

11 A I'm not sure that I have
12 that information with me, Mr. Gibbs.

13 Q Did you calculate the
14 number of trucks you would require for either the 10
15 or 20 miles per spread?

16 A Yes sir.

17 Q How many?

18 A Well, that's part of the
19 information that I don't have with me. The number of
20 trucks and the estimated average haul distance.

21 Q And that information you
22 can provide?

23 A Yes sir.

24 Q As well as the truck
25 capacity that you used for calculating your hauls?

26 A Did you say "truck
27 capacity"?

28 Q Yes, the volume of water
29 it would carry.

30 A Yes sir.

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 Q Now, sir, I'm told that
2 the biggest problem you're likely to encounter in
3 manufacturing snow is the wind problem. Is that right?

4 A It can be a problem, yes.

5 Q Even if there is a slight
6 wind it comes out as spray, and when it turns to snow
7 instead of falling where you want it, it's going to be
8 blown off.

9 A That could happen.

10 Q So that you're restricted
11 in the use of that snow for manufacturing equipment to
12 calm days.

13 A No sir. In the Edmonton
14 test we explored the possibility of manufacturing the
15 snow into a shelter, an open-ended shelter that could
16 be towed along with the other equipment and we found
17 that this would probably work quite well.

18 Q And can you describe the
19 shelter?

20 A Oh, I think it was about
21 16 feet wide and maybe 30 feet long with a gable roof
22 on the top, manufactured of plywood, and both ends were
23 open.

24 Q How high?

25 A Oh, at the peak I think
26 it was something like 15 to 20 feet.

27 Q Isn't the likely effect
28 of using that, that you're going to have the moisture
29 freeze on the inside of your shelter so that you end
30 up really with a long ice tunnel?

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Gibbs

1 A Really, that wasn't our
2 experience in Edmonton, Mr. Gibbs. It came off the
3 shelter.

4 Q But you didn't have the
5 temperatures in Edmonton you expect to encounter on the
6 North Slope, did you?

7 A Probably the temperatures
8 were higher than -- in Edmonton than they would be in
9 the early winter on the North Slope, yes.

10 Q Yes, I thought you said
11 it was mild in Edmonton when you did this test.

12 A Milder than what would
13 be expected on the North Slope, yes.

14 Q The device of using a
15 shelter to assist in manufacturing snow has not been
16 used before, has it?

17 A Not to my knowledge.

18 Q No sir. Nor has the
19 device of a -- of manufacturing snow to construct
20 snow roads for patching purposes perhaps, but not to
21 construct snow roads or pads of ten to twenty miles
22 in length.

23 A Not that I know of. I'm
24 aware of one that was half a mile long.

25 Q So that --

26 A -- in Alaska.

27 Q So that really your
28 ability to manufacture the snow and construct the snow
29 roads in the early part of the season if there isn't
30 enough ordinary snowfall is dependent upon wholly

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Gibbs

1 untried devices.

2 A No, I wouldn't --

3 Q Untried for this purpose.

4 A The whole thing -- the
5 various aspects of it are tried and proven.

6 Q But they have never been
7 used in the size of machine you propose to use with the
8 volume of snow you propose to manufacture in the time
9 you propose to manufacture it with a shelter to stop
10 the wind blowing it away. None of that has ever been
11 used before, has it?

12 A Not to my knowledge.

13 Q No sir. The second
14 instance I put to you, Mr. Williams, about the
15 possibility of having to use a gravel road and gravel
16 work pad was the instance of summer construction, and
17 you discount that entirely. Is that right?

18 A Outside of the water
19 crossings there's no plan to do summer construction,
20 in the north.

21 Q Well sir, the last time
22 you were on the stand when we talked about this, I
23 asked you then whether you had determined a temperature
24 below which work on the pipeline would not be carried
25 on and you had not then, have you now?

26 A Oh, I don't think you can
27 set a fixed temperature for the whole spread, Mr. Gibbs.
28 Some operations, I think, can go on at lower temperatures
29 than others. For instance, ditching where people are
30 enclosed in the inside the ditching^{machine} while the work is

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Gibbs

1 being done, for the most part. I think that could --
2 you would ^{probably} operate down to -45 sort of thing -- sort of
3 range there. Where people are required to work outside
4 pretty well continuously, probably -35 is a better cut-
5 off point, then some spelling off would be required. But
6 some operations can go on -- you know, seismic opera-
7 tions, for instance in the north go on to -50 and I've
8 been advised by people in the business and without
9 too much difficulty.

10 Q But sir, you've given
11 me your sort of impressions or speculation. Have you
12 established any minimum or maximum below zero tempera-
13 tures for the various kind -- parts of activities in
14 the operation when they will cease?

15 A No sir.

16 Q Have you done anything
17 like that with respect to wind chill?

18 A We have done studies with
19 respect to wind chill, but we haven't set a limit, no.

20 Q Have you set any limits
21 with respect to visibility, when there's drifting snow?

22 A No.

23 Q Have you set any limits
24 as to the daylight hours; the degree of light which is
25 required before work will be carried on?

26 A Yes, I think the limit
27 there would be no limit, Mr. Gibbs. That aspect doesn't
28 bother us at all. Since our discussion a few months
29 ago, have visited the North Slope of Alaska and seen
30 considerable construction taking place in the kind of

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Gibbs

1 daylight or lack of daylight we were talking about and
2 talked to construction people and they advised me that if
3 that was all that they had to worry about there would
4 be no problem at all. By comparison to other problems,
5 it's negligible.
6

7 (TABLES SHOWING NATURAL RESOURCE REQUIREMENTS FOR
8 PIPELINE CONSTRUCTION MARKED AS EXHIBIT 497)
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

Cooper, Hollinshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Gibbs

1 Q It's your evidence then
2 that you could work even around the clock, on all parts
3 of the pipe laying operation?

4 A Insofar as laying is
5 concerned, yes sir.

6 Q And that -- you're going
7 to do that with the floodlighting system that hasn't
8 yet been tried?

9 A Oh, that's just not true.
10 There are literally hundreds of portable floodlights
11 in use, in Alaska, and I would guess in northern Canada,
12 Mr. Gibbs, and they're working very well.

13 Q But that's how you propose
14 to do it in the dark hours, by the use of floodlights?

15 A Yes sir.

16 Q And your evidence is that,
17 that'll work just as well as daylight?

18 A No, I wouldn't say that,
19 but I would say that it can be lighted to the extent
20 that it doesn't present a serious problem.

21 Q Have you done any or
22 produced any productivity relationship between windchill
23 and the spread output?

24 A No sir.

25 Q Well sir, the reason why
26 I am going into this with you, and why I raised this
27 question of summer construction is this, and I'm going
28 to go on with it with you, but I want you to understand
29 that I'm not doing this facetiously. Foothills has
30 had a look this winter at the conditions over the

Cooper, Hollinshead, Williams,
Manning, Clark, Purcell
Cross-Exam by Gibbs

1 length of the Alaska supply leg, and the North Slope
2 generally, and at the Alyeska experience which I am
3 going to refer you to; and I ^{am} instructed that it is now
4 engaged in weighing the necessities -- necessity or
5 advisability of changing to summer construction on
6 a gravel pad up near Richards Island in the northern
7 most end, for exactly the reasons we've just been
8 going over. Has Arctic Gas given any consideration
9 to summer construction because of the impossible
10 winter conditions they're going to encounter?

11 A Oh we have to the extent
12 that several years ago we did a cost estimate of a
13 gravel road from Prudhoe Bay to the Fort McPherson
14 area, I think, Mr. Gibbs, and I think that was in 1972.

15 Q And you have not since
16 then turned your considerations towards employing
17 summer construction on the North Slope, rather than
18 winter?

19 A No sir.

20 THE COMMISSIONER: Mr. Gibbs
21 you said that Foothills, because of the winter
22 conditions, was considering what -- building part of
23 the line from Taglu south, in summer, or just a gravel
24 pad at Taglu? I missed something there.

25 MR. GIBBS: Well, my precise
26 words, I was careful to write them down, sir, were
27 these. That Foothills is now engaged in weighing the
28 necessity or advisability of changing to a gravel pad
29 and summer construction for some parts near or around
30 Richards Island.

19938

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Gibbs

1 MR. MARSHALL: Sir, I wonder
2 if Mr. Gibbs would be good enough to indicate when
3 we might expect to be advised of the outcome of these
4 deliberations that are going on within Foothills?

5 MR. GIBBS: Well, I don't
6 know, I know that they're being considered and weighed,
7 and when a decision is made, why we would expect to
8 file the necessary changes in material, both here and
9 in the National Energy Board, and in Indian Affairs;
10 because some of these examinations have just now been
11 completed and now they have to be weighed up by
12 management, and a decision made.

13 THE COMMISSIONER: When you
14 say "gravel pad construction along parts of the
15 Richards Island route," that's I suppose a wording
16 specifically designed to exclude the notion of a
17 gravel road, an all weather road.

18 MR. GIBBS: Oh no sir, the
19 road as well. It was designed not to indicate that
20 the entire northern most spread would be, that it may
21 be just some portions where the weather conditions
22 and snow conditions are such that we just can't see
23 it being done in the winter.

24 THE COMMISSIONER: And the
25 corollary is that if you do it in the summer, you have
26 to build an all weather gravel road?

27 MR. GIBBS: Yes sir. And it's
28 no secret that our position is, that in all likelihood
29 what Arctic Gas is going to have to end up doing on the
30 North Slope.

1 THE COMMISSIONER: Well,
2 Mr. Williams, let's just get this straight. If you
3 were forced to summer construction along the North
4 Slope, would you have to build an all weather gravel
5 road, to enable you to carry out your construction
6 program?

7 WITNESS WILLIAMS: I would
8 certainly think so sir.

9 THE COMMISSIONER: Yes.

10 MR. GOUDGE: Before we leave
11 the subject, Mr. Commissioner, is there ^{any} reports that
12 Foothills has developed, which go to this issue, which
13 obviously would represent a fundamental change in the
14 nature of the application at the north end, as far as
15 one applicant is concerned. We at least would be most
16 anxious to have them at the first opportunity, perhaps
17 even before any corporate decision is made.

18 MR. GIBBS: Well sir, when
19 they are ready, they will be furnished. As I said, we
20 are just starting to get the feedback back in from
21 people out running around doing these things, and the
22 corporate decision has to be made. If it's made not
23 through them, that would seem to be an end of it. If
24 there's a decision made to change, then we would have
25 to file.

26 THE COMMISSIONER: Well, in
27 any event, I'm sure that you'll be filing, well, maybe
28 we can't be sure of that, but I should think you'd
29 likely make a decision before the hearings of this
30 Inquiry are completed, and no doubt before the hearings

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Gibbs

1 in the other place are completed.

2 MR. GIBBS: If ever.

3 MR. GOUDGE: The current set.

4 MR. GIBBS: Mr. Williams, I
5 want you to refer again to some of the prepared evidence
6 of the witnesses of the state of Alaska before the
7 Federal Power Commission, on these work problems; and
8 I am referring to the prepared evidence of O.K. Gilbreth,
9 Jr., who is the director of the Division of Oil and
10 Gas, Department of Natural Resources for the state of
11 Alaska; and it's at page 13 of the prepared evidence
12 which he delivered before ^{the} Federal Power Commission.

13 MR. MARSHALL: Sir, before
14 Mr. Gibbs gets into this, I can accept that he may want
15 to refer to some evidence for purposes of putting a
16 statement to the witness to get him to agree or disagree
17 with it, and I want to record that the statement in
18 the direct evidence of a witness doesn't represent in
19 any way the complete evidence of that witness. The
20 witness that was being referred to this morning, his
21 name escapes me at the moment, was I understand
22 cross-examined at some length, and modified his
23 evidence from that in his direct evidence as a result
24 of that cross-examination. Copeland I think was the
25 name of the gentleman. I simply want to point out that
26 by putting that statement, and our not objecting to
27 it, we're not in any way accepting that that was the
28 evidence given by that witness.

29 MR. GIBBS: Well sir, I was
30 trying, I think, in the previous quotations, carefully

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Gibbs

1 to ask Mr. Williams to comment as I went along, and
2 that's what I propose to do here. The question, Mr.
3 Williams, as to O.K. Gilbreth, is this, "Can you
4 describe common problems occurring in construction
5 work on the North Slope?" Answer,

6 "Yes. Naturally the cold itself is one of the
7 major problems, and as temperatures approach
8 35 degrees below zero, the output of each man
9 decreases considerably." Now, ^{do} you agree with
10 that position?

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 A If the man is required to
2 work out in those temperatures, yes sir.

3 Q He goes on to say:
4 "Based upon my experience and the experience
5 of field supervisors, I believe that human
6 efficiency is only 10 to 20% of normal, at
7 temperatures or wind chill equivalents below
8 35 degrees below zero."

9 Would that accord with your observations?

10 A I don't think that that's
11 been the experience of the pipeline industry in Canada,
12 Mr. Gibbs, no, I wouldn't agree with that.

13 Q But then the pipeline
14 industry in Canada has not been constructing in these
15 kind of conditions.

16 MR. MARSHALL: You're talking
17 about temperature conditions, temperature and wind chill?

18 MR. GIBBS: I'm talking about
19 temperature and wind chill conditions, yes.

20 Q And is it your
21 experience that operating in temperature and wind
22 chill conditions of 35 degrees below zero there has not
23 been that kind of reduction in work out?

24 A That has been my experience,
25 yes.

26 Q And what is your exper-
27 ienced based upon? What operation, what construction?

28 A Oh, I have a report for
29 instance on looping on TransCanada Pipelines in Northern
30 Ontario where work was carried on at temperatures between

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 minus 35 and minus 40, and production didn't vary that
2 greatly from days that were warmer, I have been out
3 myself on the pipeline right-of-way in that kind of
4 temperature and certainly there is some reduction in
5 performance, but not to the 10 or 15% quoted there.
6 I just repeat that I don't think that's been the
7 Canadian experience.

8 Q All right, except that
9 you wouldn't surely equate a building of a loop with
10 building some hundreds of miles of line.

11 A Why not?

12 Q I don't want to argue
13 with you, but ^{would} you say building a 10-mile loop, for
14 example, is the same as building a 50 or 60-mile piece
15 of line.

16 A If you have to work at
17 40 below it's pretty close to being the same, I think.

18 Q Mr. Gilbreth goes on
19 to say:

20 "Human,"
21 speaking of the 35 degrees below zero,

22 "Human output decreases considerably at that
23 time and there are many, many cases on record
24 where significant additional time and expendi-
25 tures have been required to perform a job at
26 these temperatures as compared to normal work
27 during the summertime or when temperatures are
28 above freezing."

29 Now, you would agree that because efficiency reduces,
30 cost proportionately goes up in comparison with say

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 a higher temperature.

2 A Yes sir.

3 Q And he says also:

4 "At extremely cold temperatures we have
5 cold weather embrittlement problems with
6 metals."

7 Would you agree that that's going to occur?

8 A He hasn't yet quoted a
9 temperature.

10 Q No, I don't think he does.

11 I'll go on:

12 "Special metallurgical requirements in iron
13 and steel are necessary to prevent failures
14 at these low temperatures. For example,
15 such things as car and truck axles snap
16 easily, nuts and bolts shear, and ripper
17 teeth on dirt movers break easily. Many of
18 these items do not have properties that will
19 prevent breaking or fracturing when the tem-
20 peratures drop to this level. A sledge hammer
21 dropped on a rig floor at 50 degrees below
22 zero may well sustain metallurgical fractures
23 as a result of the impact. Later in 40 degrees
24 Fahrenheit, above zero may literally shatter
25 as a windshield does."

26 MR. MARSHALL: Mr. Commissioner,
27 I think Mr. Gibbs is taking this much too far. If he
28 wants to get this sort of thing in evidence, let him
29 call this witness and we can cross-examine as he was
30 cross-examining our witness. If he wants to put a

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 simple proposition to Mr. Williams and ask him if he
2 agrees or disagrees with it, I have no objection to
3 that. But I don't think reading extensive passages from
4 prepared direct evidence in another proceeding is
5 really the proper way to go.

6 MR. GIBBS: Well, sir, this
7 -- we've seen this process gone through with reports
8 read from and quoted from and commented on. Now I
9 suppose if my friend wishes, and certainly if you
10 instruct, we fold the book up and we ask Mr. Gilbreth
11 to put in the same evidence; but it seemed to me that
12 this is exactly on point with exactly what Arctic
13 Gas is proposing to do, and it would be in order for
14 Mr. Williams to comment. If he says, "No, I don't
15 agree with it," then if we want to prove it we will
16 have to bring Mr. Gilbreth.

17 THE COMMISSIONER: Well, I
18 agree with you, Mr. Gibbs. The Inquiry isn't a
19 Court of law, we're not bound by the rules of
20 evidence, and that throughout the transcript of what
21 is said under oath at the Federal Power Commission
22 hearings can be introduced here, the whole transcript
23 marked as an exhibit and it is then evidence for
24 whatever it is worth in that form. Now, in those
25 circumstances I see nothing wrong with Mr. Gibbs saying
26 "Mr. Gilbreth said so-and-so, what do you say,
27 Mr. Williams?"

28 It seems to me it gives Mr.
29 something
30 Williams to which to address himself too, instead of
simply dealing with assertions coming from the mouth

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 of Mr. Gibbs ^{that} Mr Williams might be tempted to regard
2 as not worthy of extended comment, so I think we'll
3 let you go on in this vein.

4 MR. GIBBS: Q Mr. Williams,
5 there are a couple more paragraphs dealing with these
6 metal failures, and I ask you whether it isn't your
7 experience at low temperatures of 35 or 40 degrees
8 that you're likely to encounter metal failures through
9 cold weather embrittlement?

10 A I'll agree with Mr.
11 Gibbs that if you went into the north without taking
12 these factors into account and go in properly equipped
13 that yes, you could have problems.

14 Q And that will affect your
15 productivity.

16 A If you hadn't prepared
17 yourself properly.

18 Q Well, it's pretty hard
19 to prepare yourself properly against broken axles
20 through embrittlement, isn't it, unless you have a whole
21 new vehicle ^{constructed} of different metallurgy?

22 A Sure, but there are pieces
23 of existing equipment, for instance, side booms or
24 cranes or what-not, where if the boom breaks you can
25 have problems. I would expect that that kind of
26 equipment would be low temperature steel, and you'd
27 be foolish to go north without it. You can't go prepared
28 against all these possibilities -- truck axles and
29 what-not -- but you can go a long way.
30

Williams, Purcell, Hollingshead
Mining, Cooper, Clark
Cross-Exam by Gibbs

1 Q After dealing, talking
2 some more about the metallurgy problems, and embrittle-
3 ment, he has this to say:

4 "Any North Slope pipeline construction planned
5 for the month of November through April must be
6 carried out under careful regulatory supervision.
7 It is my personal opinion that construction from
8 December 1 or not later than December 10 to
9 January 15 is not feasible or advisable on the
10 North Slope in Alaska. During this time
11 weather is extremely cold. The holiday spirit
12 prevails. Workers desire to spend the holidays
13 with their families and virtually nothing is
14 accomplished."

15 Now, sir, based on that and what you said about the
16 Alyeska experience, isn't this going to happen, Mr.
17 Williams, that your pipe-laying operation is going to
18 be shut down from about the first ten days of December
19 to sometime later in January?

20 A I don't think so, Mr.
21 Gibbs, no.

22 Q Well, hasn't -- isn't
23 that what has happened in Alyeska?

24 A On the main stem, a 48-
25 inch system, that's what happened. On the oil-gather-
26 ing system it did not happen. On the small diameter
27 gas line construction it did not happen. On explora-
28 tion and drilling programs it did not happen. On the
29 Arctic Island construction in Canada it did not happen.
30 On Alyeska 48-inch line, it did happen.

Williams, Purcell, Hollingshead
Lanning, Cooper, Clark
Cross Exam by Gibbs

1 Q Yes sir, and it happened
2 because they could not hold the crews there, and isn't
3 the difference, Mr. Williams, this, that on drilling
4 operations and those smaller pipeline operations,
5 gathering system operations, you normally have crews
6 that work together for some period of time, and
7 smaller crews; you don't have what you're going to have
8 on your construction, ^{is} the wholesale import of numbers
9 of three to 5,000 men, and that you then get a
10 different atmosphere of working with that kind of
11 imported or put-together crews.

12 A No, on the Alyeska job
13 they had been working for oh, eight or nine months
14 prior to Christmas, and quite a few of the construction
15 people had put in long months in that period. They
16 were probably a little bit tired and their bank roll
17 was fat and so they went home. Our project is not,
18 I don't think, quite the same, where the main part of
19 the construction is going to start in October and
20 November, and if they've had a lean summer, they would
21 be glad to work through the Christmas holiday.

22 Q Well, Mr. Williams, I'm
23 not going to stay too long on this, but I put it to you
24 that what you're expressing is a hope, but what in
25 reality is probably going to happen is that they're
26 going to, for the same reasons as Alyeska, about the
27 middle of December your work output is going to fall
28 off because they're not going to stay.

29 A Some people will go home,
30 Mr. Gibbs, I think that work can continue.

Williams, Purcell, Hollingshead
Minning, Cooper. Clark
Cross-Exam by Gibbs

1 Q And that will immediately
2 affect your work output, and if they're key people that
3 will shut it down.

4 A They are the ones that
5 tend to stay.

6 Q If it's the welders,
7 won't that bring you to a halt?

8 A Yes sir.

9 Q And aren't those the ones
10 who normally tend to go, Mr. Williams?

11 A Oh, it just depends on --
12 I've seen them in Northern Alberta working with just a
13 couple of days off for Christmas, Mr. Gibbs.

14 Q And you've also seen
15 them in Alberta close plants down, close pipeline
16 operations down, and it's also your knowledge, isn't
17 it, Mr. Williams, that the welder is really the key
18 person and the one who is most likely to take that
19 kind of action?

20 A No, I would say it
21 depends on the circumstances at the time.

22 Q All right, and Mr.
23 Williams, doesn't your own personal experience of
24 being out on the North Slope in the dead of winter, and
25 I take it you have --

26 A Yes sir.

27 Q -- as well as the
28 experience of people here who have been there under
29 those conditions, indicate to you that it may well
30 not be possible to construct that line across the North

1 Slope during the wintertime?

2 A No, I wouldn't have been
3 a party to putting the construction plan together if
4 I thought that, Mr. Gibbs.

5 Q If you do lose time in
6 your construction output by reason of weather, and
7 metal failures, and not enough snowfall, and all of
8 those contingencies, and can't complete your construction
9 in one winter, then what do you propose to do, carry
10 on into the following summer or wait until the following
11 winter?

12 A Well, we've said many
13 times here at this forum, Mr. Gibbs, that we would try
14 to take remedial action to catch up the schedule in the
15 second and third winters.

16 Q But I'm now talking
17 about the Alaska supply line, and if you can't complete
18 that in one winter then will you wait till the follow-
19 ing winter or would you carry your construction on
20 over into the summer?

21 A Oh, from what I know
22 now I think it would have to wait till the following
23 winter, I don't think that summer construction would
24 be allowed in that area.

25 Q And that being a possi-
26 bility, sir, has there been any calculation of the
27 cost effect of delaying to another winter season?

28 A Not to my knowledge.

29 Q Have you been asked to
30 make any calculations on even a contingency basis on

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 what might happen to the dollar costs?

2 A No sir.

3 THE COMMISSIONER: On that
4 subject of costs, have you looked into the feasibility
5 of an all-weather gravel road from Prudhoe Bay to
6 Fort McPherson in 1972 when the prime route took
7 you around the delta? Apart from environmental
8 considerations, putting those aside if it's possible
9 to do so, is the objection to summer construction the
10 cost of building an all-weather gravel road as well
11 as building the pipeline itself?

12 A In our opinion the added
13 cost of the all-weather road and right-of-way would
14 be more costly than the plan we have filed. Yes.

15 Q Any idea of the difference
16 in cost between building the Prudhoe Bay leg in summer
17 and building it in winter?

18 A No, we haven't done that
19 sir. The study just went to the extent of calculating
20 the cost of a gravel road across the slope.

21 MR. GIBBS:
22 Q And do I take it, Mr.

23 Williams, that your position is this, that if it can't
24 be built in the wintertime it won't be built at all?

25

26

27

28

29

30

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Gibbs

1 A Oh, Mr. Gibbs, all I that
2 can say is that the plans that Arctic Gas have put
3 forward are to build it in the -- build it in the winter-
4 time. We haven't done any study except this one I
5 mentioned with respect to summer construction, but I
6 suppose a person could speculate and say that if the
7 energy shortage became very acute and governments in
8 Canada and the United States decided that they needed
9 the gas as quickly as possible and this was a decree
10 of governments, possibly it could happen that summer con-
11 struction would take place, but it's -- you know, we
12 just haven't done a study on that.

13 MR. MARSHALL: I think Mr.
14 Gibbs, this is an area you're going to have to ask Mr.
15 Horte about as to whether or not Arctic Gas as a matter
16 of policy would consider that hypothetical situation
17 you put forward.

18 MR. GIBBS: Is Mr. Horte
19 going to be back again before the Inquiry?

20 MR. MARSHALL: Well, I was
21 thinking you'd have chances to talk to him at the
22 National Energy Board.

23 MR. GIBBS: Well yes sir, but
24 neither Mr. Commissioner nor anyone else is likely to
25 be there to hear what his answer is that matters here.
26 So, is he going to be here?

27 MR. MARSHALL: Well, we
28 haven't finalized all our plans. I ^{think} we'd indicated
29 that we'd call Mr. Horte at the end of the first phase,
30 which we did and Mr. Blair was called and we would

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Gibbs

1 likely recall him again at the end of subsequent phases,
2 and tentatively we would call him towards the end of
3 the fourth phase.

4 MR. GIBBS: Then sir I'm -- if
5 that's what's going to happen, I'm content --

6 MR. MARSHALL: Yes.

7 MR. GIBBS: -- to ask Mr.
8 Horte those type of questions. I hadn't appreciated
9 that we were going to see another Arctic Gas employee
10 on the stand.

11 Q Mr. Williams --

12 MR. MARSHALL: We'll have Mr.
13 Hemstock next -- on the next panel.

14 MR. GIBBS: Well in that respect,
15 I understood that Mr. Hemstock was seconded to Arctic
16 Gas and not an Arctic Gas employee.

17 THE COMMISSIONER: Well, does
18 that matter very much?

19 MR. GIBBS: No sir.

20 Q Mr. Williams, can we come
21 back for a little while to the construction techniques
22 for the channel crossings and in every one of the four
23 cases, of the four channel crossings, you've told
24 me you're going to use a dredge, as well I take it,
25 that in each case you're going to pull the pipe across
26 by a winch after the trench is dug. Is that right?

27 A Yes sir.

28 Q Then in the normal course,
29 lower it and backfill it?

30 A Yes sir.

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Gibbs

1 Q Can you tell me where
2 you intend to deposit the excavated material from the
3 60 or 75 foot deep trench at Langley?

4 A Downstream of the crossing.

5 Q Isn't that going to
6 create a huge pile of downstream material in the channel?

7 A No, some of it will be
8 retrieved and used as backfill.

9 Q After it's been deposited
10 then you propose to turn around and dredge it up and
11 bring it back again?

12 A Some of it.

13 Q You spoke about the kind
14 of dredge. Would you repeat that again, identify it
15 as to make, and however you identify these things?

16 A I said the information
17 that we obtained with respect to dredging equipment
18 came from SceptreDredge.

19 Q Are you able to identify
20 the dredge that you propose to use?

21 A Identify the dredge that
22 is proposed?

23 Q Well, for example, airplanes
24 are called 707's and cats are D.C.D. something. Can
25 you tell me a number or a designation by which I can
26 find out what kind of dredge it is?

27 A No, I might be able to
28 get that for you, Mr. Gibbs. But again, it's what the
29 plan was based on, was this 36 inch dredge
30 as suggested by Sceptre Drilling or Dredging. No, I

Cooper, Hollingshead, Williams
Minning, Clark, Purcell,
Cross-Exam by Gibbs

1 don't have the make and model number. I might be able
2 to get that.

3 Q Would you do that, please?

4 A I'll try.

5 Q When the dredge is operat-
6 ing, Mr. Williams, will it need any support vessels?

7 A Yes, some support. Yes,
8 certainly, yes.

9 Q Can you tell me the
10 number and kind of support vessels?

11 A I, again -- I don't
12 think I have that with me but some support will be
13 required for moving the discharge piping around for
14 the crew and probably some during the pulling operation.

15 Q And for fuel and for
16 maintenance?

17 A Yes.

18 Q The crew for the dredge,
19 it has its own separate floating camp, does it?

20 A Yes.

21 Q That will then require
22 some support vessels.

23 A Yes.

24 Q Mr. Williams, can you
25 supply a list of the different kind of support vessels
26 and the function of each one?

27 A That could be done.

28 Q Will you do it?

29 A Yes sir.

30

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross Exam by Gibbs

1 Q Now Mr. Williams, how
2 are you proposing to backfill the trench across each
3 of the channels?

4 A With the dredging equip-
5 ment, mainly, at the shorelines. If granular material
6 is required, it will be pushed in from the work pad
7 areas.

8 Q After the pipe is lowered
9 into the ditch, then you propose to take the dredge.
10 Where will you get the backfill from that's going to
11 be put back in the trench by the dredge?

12 A From the pile that's
13 downstream that was put there from the excavation or
14 what is left of it. It won't all be there. Some will
15 have migrated downstream. Some will be there. The
16 heavy particles will tend to remain pretty close to the
17 discharge end of the dredge line.

18 Q Well sir, if you're
19 discharging it some 200 feet away, I think you told me
20 yesterday, won't that involve that dredge moving out
21 of where it has been for the trenching to pick up the
22 backfill and somehow bring it back to dump in the trench?

23 A Yes.

24 Q Therefore, the dredge
25 will have to dredge a channel for itself to get where
26 the backfill has been dumped?

27 A Not necessarily, no. The
28 -- you can extend the discharge line on the dredge to
29 move it a fairly good distance.

30 Q Would you expect then to

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Gibbs

1 park(?) the dredge over the backfill and then dredge
2 up the backfill, dredge up what has been discharged
3 there and then put it in the trench by means of the
4 discharge line?

5 A Yes.

6 Q But you will not have
7 enough, I think you said, of that excavated material
8 to backfill completely?

9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Gibbs

1 A I don't think it's
2 necessary to backfill completely, Mr. Gibbs.

3 Q You will just backfill
4 to the extent that there is some of the excavated
5 material left?

6 A Yes, and let the remaining
7 backfill occur naturally.

8 Q Mr. Williams, how many
9 days is it going to take for the winch to pull the
10 string across Shallow Bay?

11 A Oh, I'm not sure what
12 we have in our estimate, Mr. Gibbs. I could get that
13 information for you, I could speculate, and say
14 probably two or three days.

15 Q And isn't that the
16 largest string or pulling operation for pipe laying
17 that's been done in Canada, what you're proposing?

18 A I understand that the
19 crossing in the Strait of Mekanak is about the same
20 length, Mr. Gibbs.

21 Q And the same kind of pipe?

22 A I think it was a little
23 smaller than 36 inch.

24 Q And it was installed in
25 the same fashion, was it?

26 A Yes sir, that's my
27 understanding; I wasn't there.

28 Q How long is it going to
29 take for the dredge to backfill the trench across
30 Shallow Bay?

1 A Again, I don't have that
2 number. I wouldn't expect it to be too long.

3 Q Well sir, what I'm
4 really trying to assess is the likelihood of you getting
5 that operation done between mid-June and early
6 September, and I would really like to have those days
7 more than speculation, more firmly if you have those
8 numbers available.

9 A Yes, I can get those
10 numbers.

11 Q And will you get those
12 and furnish them?

13 A Yes sir.

14 Q And is it now your firm
15 present plan not to use gravel backfill in the trenches
16 for the four major channel crossings?

17 WITNESS CLARK: All of the
18 tests that we've done to date, and there's been some
19 thirty of them, on liquifaction tests, which was the
20 reason for that gravel, have indicated that it's not
21 going to be required. We'd want to do some more tests
22 before making that final decision.

23 MR. GIBBS: Sir, I sort of
24 hesitate to get into questions of transportation and
25 stockpiling of gravel, if the biggest likelihood is that
26 you're not going to use gravel.

27 A I would say that's the
28 biggest likelihood now.

29 Q And if that changes, and
30 you come back to a decision to use gravel backfill in

Cooper, Hollingshead, Williams,
Mining, Clark, Purcell
Cross-Exam by Gibbs

1 those trenches, can you then return to be cross-examined
2 on such things as transportation, logistics and stock-
3 piling and so on.

4 MR. MARSHALL: Yes, I think
5 that could be done. I don't have any idea of the time
6 over which these tests might be carried out, Mr. Gibbs.

7 A I don't see
8 these tests being done until we're very close to
9 final design.

10 MR. GIBBS: All right, then,
11 perhaps we'd better pursue it on the basis -- on the
12 assumption that you are going to use that 2.7 million
13 cubic feet of gravel.

14 MR. MARSHALL: Well, I think
15 he said that's not the assumption, it's a possibility.
16 You can proceed on that basis if you want.

17 A You remember talking about
18 340,000 cubic yards, I think.

19 THE COMMISSIONER: That's
20 what it would take to backfill the trench across
21 Shallow Bay.

22 A To the level required
23 for liquifaction. That's not the full backfill.

24 THE COMMISSIONER: You
25 mentioned the problem of liquifaction this morning.

26 A Yes.

27 THE COMMISSIONER: How deep
28 would then that be -- how deep -- what would be the
29 depth of the gravel be on top of the pipe?

30 A I can't remember --

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Gibbs

1 WITNESS HOLLINGSHEAD: I think
2 that that estimate was based on taking the gravel up to a
3 level three feet above the top of the pipe.

4 THE COMMISSIONER: Anyway,
5 it's 300,000 cubic yards, apparently.

6 A I believe it's 170 for
7 each ditch, for each crossing.

8 THE COMMISSIONER: Okay, 340.

9 MR. GIBBS: Well Mr. Williams,
10 let's deal with it as part of the 2.7 million cubic
11 yards shown on map as "Borrow Requirements". Have
12 you identified the sources from which that 2.7 million
13 cubic yards will be obtained?

14 WITNESS WILLIAMS: Yes, they're
15 shown on the strip maps

16 Q And how much -- will you
17 tell me those sources and how much will come from each.

18 A This is for the total --

19 Q The total you show for
20 Spread B on your map, IK02511001.

21 A The 2,730,000?

22 Q Yes.

23 A Of the 2,730,000 yards
24 required, 1,800,000 is planned to be taken from the
25 Yaya area on Richards Island, the remaining 930,000
26 from the west side of the delta. Some of that, well,
27 I was going to say some of it could come from Shingle
28 Point, but Miss Minning has in her direct evidence shown
29 numerous potential sources on the west side of the
30 delta, from which that 900,000 yards could be taken.

Q Is there any coming from

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Gibbs

1 Shingle Point?

2 A That's a possibility.

3 Q Well sir, can you put
4 it any firmer than that at this point, because this
5 clearly affects your logistics and your timing.

6 A Well, the plan Mr. Gibbs
7 was that if the 400 -- I'm sorry -- 340,000 yards of
8 backfill in Shallow Bay was required that we would
9 consider taking it from Shingle Point, by barge, and
10 bottom dumping it on the line in Shallow Bay.

11 Q And it is only then for
12 that purpose that you are looking to Shingle Point?

13 A Perhaps before the 1975
14 granular borrow study was completed, it was estimated
15 that more than that would come from Shingle Point.

16 Q But it is now your
17 estimate that only what would be required for the
18 backfill across Shallow Bay would come from Shingle
19 Point. Is that right?

20 A Well, it's not firm yet,
21 Mr. Gibbs. These other locations that Miss Minning
22 has in her evidence are generally closer than Shingle
23 Point to where they're required, but they do have a
24 problem in that you have to -- if you're trucking it
25 you have to get down the hill into the delta from
26 the source, and this could be a problem; with the
27 exception perhaps of that GM-150, I think that's
28 shown there, which is a bedrock exposure. That is at
29 a lower elevation.

30 Q And you propose to move

1 the gravel, the 2.7 million yards, by a mixture of
2 barge traffic and truck traffic.

3 A Mostly truck traffic, yes.

4 Q Are you able to divide
5 those quantities into how much will be moved by truck
6 and how much by barge?

7 A I don't think we could
8 right now, no.

9 Q You can't therefore tell
10 me how many barges you will need, or how many trucks?

11 A Not firmly, until this
12 decision, a firm decision on the backfill at Shallow
13 Bay is made.

14 Q Well, leaving out the
15 question of Shallow Bay, subtracting that, are you able
16 then with the remainder to divide it into the volume
17 to be moved by truck, and the volume by barge?

18

19

20

21

22

23

24

25

26

27

28

29

30

1 A Most of it would be
2 trucked if that Shallow Bay requirement does not become
3 real.

4 Q All right. Can you tell
5 me the truck -- the probable truck capacity. There
6 you talk about 50 yard trucks, or whatever are used
7 up on the drilling sites.

8 A I don't think that large,
9 Mr. Gibbs, more in terms of 20 yards.

10 Q All right. Lastly on
11 that point, can you tell me whether you have computed
12 the average length of a round trip for those trucks?

13 A Oh, I'm sure that has
14 been done for estimating purposes. I don't have it
15 with me.

16 Q Could that number be
17 produced and provided, please?

18 A I think so.

19 Q Do you propose to stock-
20 pile the gravel at some place before using it for the
21 purposes you've set out on your map?

22 A Only at -- No, I would
23 think only at the pit -- the point of origin. Not
24 out in the field. It would be -- it would be trucked
25 to the location it's required.

26 Q Trucked directly there
27 and immediately used as soon as it was dumped?

28 A Yes.

29 Q All right, sir. Mr.
30 Williams, do you propose in any of your channel operations

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Gibbs

1 to use a lay barge?

2 A No sir.

3 Q Well, I understood you
4 in operation and maintenance evidence to say that you
5 would have a lay barge at Tununuk for repair purposes,
6 and I wondered where that was coming from.

7 A That's what it says. There
8 might have been a breakdown in communications between
9 the O and M section and the construction section, Mr.
10 Gibbs. I'm not aware of having even a small lay barge
11 in our cost estimates. There certainly will be a fair
12 bit of marine equipment used in the construction.

13 Q But it's extremely unlikely
14 that if you hadn't used a lay barge in construction,
15 you're likely to obtain one purely for operations and
16 maintenance?

17 A If someone in the operation
18 and maintenance section thought that it was necessary,
19 I suppose they would obtain one.

20 Q The purpose of a lay barge
21 though is to lay pipe isn't it? It's an alternative to
22 pulling the string across?

23 A Yes sir.

24 Q It really wouldn't have
25 much practical use in operations and maintenance.

26 A I wouldn't think so.

27 Q Also in your operation
28 and maintenance evidence, Mr. Williams, at page one,
29 you refer to amphibious vehicles.

30 "Maintenance crews will have special amphibious

19966

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Gibbs

1 transport capability that are equipped with back-
2 hoes or A-frames of Gantry type cranes in the
3 hydraulic winches."

4 Does that kind of amphibious equipment now exist?

5 A I'm not sure, Mr. Gibbs.

6 I know that operation and maintenance group of Arctic
7 Gas have been doing some work in this area. I'm not
8 completely familiar with it. If you have a particular
9 question, I could try to get an answer for you or Mr.
10 Carlson will be here in phase four. Perhaps he could
11 answer it then.

12 Q Well, my only question
13 was to describe it, because it was indicated to me that
14 it probably doesn't now exist and was going to have to
15 be some new kind of technology. Now, should I leave that
16 to Mr. Carlson?

17 A Yes, if you would please.

18 Q All right. That's in
19 phase four?

20 A Yes sir.

21 Q Mr. Williams, what dictated
22 the choice of distance between the twin 36 inch lines
23 at the various stages of different distance across the
24 cross-delta?

25 A Oh, mainly engineering
26 judgment, Mr. Gibbs.

27 Q Well, for example, you've
28 got 200 feet apart, as I recall it, across Shallow Bay.

29 A Yes sir.

30 Q That's just a matter of

Cooper, Hollingshead, Williams
Minning, Clark, Purcell,
Cross-Exam by Gibbs

1 engineering judgment?

2 A Well, we kicked around
3 the idea of putting the two lines in one wide trench
4 and didn't -- that idea didn't appeal to us too much
5 in case of a failure, in one line. We weren't certain
6 what would happen to the second line. We did a bit of
7 an economic analysis to see how wide the bottom of
8 a trench would have to be to -- a single trench to
9 equate to the similar yardage for two trenches. I
10 recollect that it's somewhere in the vicinity of 50 feet.

11 If you had a 50 foot bottom,
12 a single trench 50^{foot} bottom, you'd be excavating the
13 same number of yards as two one-line trenches and
14 decided that 50 feet wasn't sufficient separation so
15 we're faced with two separate trenches then. In our
16 opinion, 200 feet was an adequate separation across
17 Shallow Bay.

18 Q 200 feet was really
19 enough to accomodate the width of the trenches at the
20 top and leave something between?

21 A No.

22 Q It was just, then, 200
23 feet seemed to be a good number then?

24 A Like I said it was an
25 engineering judgment.

26 Q Well, that really is what
27 it is then, whether you call it engineering judgment or
28 not, it seems like 200 is wider apart than 50 and less
29 than 300 and it's as good a number as any?

30 A Well, I don't know, I

Cooper, Hollingshead, Williams
Minning, Clark, Purcell,
Cross-Exam by Gibbs

1 thought I went through a reasonable explanation of
2 how it was arrived at, Mr. Gibbs. If you don't like
3 it, I suppose there's not much that I can do about it.

4 Q Well, I understood sir,
5 your explanation of why you didn't put the two into
6 one trench, but then why the 200 instead of 250, I
7 couldn't quite understand.

8 A Because in our engineering
9 judgement, 200 was a wide enough separation in case of
10 failure in one line.

11 Q All right then why 50 feet
12 apart on the overland portions?

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 A I think it was decided,
2 Mr. Gibbs, that 50 feet was adequate when dealing
3 with 36-inch pipe to -- that two ditches could be
4 opened up at the same time, for instance, if that was
5 deemed practical, that there was still enough working
6 room between the lines to install the one that where
7 the equipment would be required to work between the
8 two lines. My memory is a little hazy on the reasoning.

9 MR. GIBBS: Mr. Commissioner,
10 although it's a little before the normal break time,
11 I notice a sort of suffering effect of the heat
12 in this room and wonder if we might break a little
13 early?

14 THE COMMISSIONER: Well, just
15 before we do, the questions that Mr. Gibbs has been
16 asking about winter construction are important
17 questions -- and his argument, the whole Foothills
18 case that the supply leg from Prudhoe Bay cannot be
19 built in winter is important too. I just ask you
20 to bear this in mind when we come to final argument,
21 Mr. Marshall, and Mr. Horte might wish to comment
22 on it before then; if that supply leg from Prudhoe
23 Bay cannot be built in winter but must be built in
24 summer, then we are looking at a new pipeline. I say
25 that because my recollection of the evidence of Dr.
26 Banfield and Mr. Jakimchuk on the subject of caribou
27 and the evidence of Dr. Gunn on the subject of birds,
28 and I mention those three witnesses because they were
29 all witnesses called by Arctic Gas; in the case of each
30 one of those witnesses they predicated their willingness

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 to agree that the Arctic Gas Pipeline could be built
2 from Prudhoe Bay without undue environmental damage on
3 the assumption that it would be winter construction.
4 If it were in summer, then the construction would cross
5 the Northern Yukon and cross the North Slope of Alaska
6 and the Northern Yukon at a time when the Porcupine
7 caribou herd was calving, and would cross the delta
8 at a time when the birds would be nesting. The
9 approval that Arctic Gas' own experts gave to the
10 project from an environmental point of view appeared
11 to me to be predicated on the winter construction.

12 At any rate I'm not going to
13 ask you to deal with that now, but just bear it in
14 mind in final argument when we reach the evidence of
15 Dr. Banfield and Mr. Jakimchuk and Dr. Gunn.

16 Well -- because that was your
17 case, that's what I was really getting at. So
18 all right, we'll adjourn for coffee.

19 (PROCEEDINGS ADJOURNED AT 3 P.M.)
20
21
22
23
24
25
26
27
28
29
30

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

MR. GIBBS: Q Mr. Williams,
can you tell me the distance between the lines as
they cross each of West Channel, the Middle Channel, and
Langley Channel?

WITNESS WILLIAMS: I think Dr.
Hollingshead has that information.

WITNESS HOLLINGSHEAD: The
North Arm Reindeer, or Middle Channel^{as} it's sometimes
referred to, and the Langley Island Channel, you're
looking at a separation of two or 3,000 feet.

Q I'm sorry, how much?

A Something in the order of
3,000 feet. This could be scaled off the drawings
more accurately, but the reasoning there is the same
as that which prevailed at the other major crossings
else where in the system, that this was nominally
at this preliminary design stage the equivalent of
about one channel width.

Q And the other channel,
West C hannel?

A Well, as we said
previously, we haven't given detailed consideration to
West Channel. I think it's shown on the strip maps
as probably a 200-foot separation, but I could check
that.

Q Well, as I understood
it on the one river^{width} concept on the other major river
crossings, it was to avoid both lines being taken out
by scour.

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 A That's essentially correct,
2
3 yes.

4 Q But as I understand your
5 evidence here, that scour is not a problem in the
6 Middle Channel or the Langley Channel.

7 A No, I don't think that --
8 I don't^{think} that we said it's not a problem. It's a consider-
9 ation. It's certainly not a problem of the same magni-
10 tude as it is on the main stem of the Mackenzie; at this
11 stage it's still a consideration in those channels.
12 It's not the same consideration in Shallow Bay.

13 Q
14 On the other channels then you
15 do expect ice scour similarly to the major river
16 crossings.

17 A No, not ice scour.

18 Q Water scour, then.

19 A Scour due to the action
20 of the channel waters.

21 Q But you don't expect
22 the same degree in Shallow Bay?

23 A No sir.

24 Q Dr. Hollingshead, while
25 you're talking, I wonder if you'd explain a couple of
26 your statements in your direct evidence? At page
27 3 in the second full paragraph you say:

28 "Because the delta environment is dynamic

29 the permafrost conditions are as well.

30 Permafrost is aggrading upwards in areas

such as flood plains where sediment is

being deposited yearly, and permafrost is

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 also aggrading downwards."

2 Do I take it from that that throughout the delta you
3 see the permafrost as continuing to increase in thick-
4 ness?

5 A In some places, I believe
6 it is increasing in thickness, yes.

7 Q Well, is that a sort of
8 isolated local condition, or is it generally prevalent
9 across the delta?

10 A No, this would be
11 isolated locally.

12 Q And do those local
13 conditions occur with very great frequency?

14 A I don't think I could
15 put a number on it in terms of the delta as a whole.
16 I could think of a couple of places where this may
17 well be happening and on that basis it would not be
18 a wide occurrence, no.

19 Q It's not something to
20 be weighed really seriously in terms of geographic
21 extent?

22 A Well, it's not a serious
23 problem, I don't think.

24 Q All right, then on page
25 6 of your prepared evidence --

26 A Very well, sir.

27 Q -- on page 6 you refer
28 to the design discharge of the Peel River and the 100-
29 year flow for the Mackenzie River at Point Separation
30 to obtain a preliminary design flow value of 1,600,000

Williams, Purcell, Hollingshead
Minning, Cooper, Clark
Cross-Exam by Gibbs

1 cubic feet per second. Do you see that?

2 A Yes sir.

3 Q In determining that number
4 did you take into -- did you give any effect to tides
5 or the action of storms on the channel water?

6 A The action of storms or
7 tides do not affect that number, no.

8 Q Well, if you got a storm
9 blowing from offshore, / which
10 as I understand it can develop
11 a head of water up the channel and when a storm blows away
12 you have that water coming back out to sea, would that
13 flow be included in your 1.6 million cubic feet per
14 second, that kind of occurrence?
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Gibbs

1 A My guess is that those
2 flows, under both circumstances, would be well below
3 the 1.6 million total.

4 Q It's your evidence that
5 the 1.6 million is a maximum likely flow?

6 A I guess the answer is
7 that we really can't say one way or the other, but
8 in any event, they're not numbers that we are relying
9 on to -- for the design of the channel crossings, to
10 that extent, it's somewhat irrelevant.

11 Q That answer is
12 irrelevant?

13 A The numbers that you're
14 searching for, that is whether in fact the outflow
15 could exceed 1.6 million in total.

16 Q It's your evidence that
17 the flow value has nothing to do then with the design
18 of the crossing, is that it?

19 A Well this value that's
20 quoted here is a total discharge for the -- through the
21 delta -- for the combined Mackenzie, Peel system, and
22 our designs for the channel crossings are based on the
23 design flow values for each of the individual channels,
24 distributory channels; but this is one place where we've
25 started.

26 Q Then, what you say here,
27 preliminary design flow value of 1.6 million cubic
28 feet per second, really is sort of excess information,
29 it has nothing to do with your design?

A I would agree with the

1 first part of what you said, that it's probably excess
2 information, helpful excess information; but I'm not
3 sure that I would agree that we had nothing to do with
4 the design.

5 Q Well, all it has to do
6 with the design, isn't this so, that you took that and
7 then divided that flow between the various channels?

8 A In a general way, yes,
9 in a general sense, but each of the distributary
10 channels has been assessed individually, and so that
11 in that respect, the design flows for each -- for all
12 of the channels in total, was for -- would probably
13 exceed the 1.6, I suppose.

14 Q Well sir, where do I
15 find the number for each of the distributor channels?

16 A In a report entitled
17 "The Preliminary Design Of Four Major Water Crossings
18 On The Cross-Delta Pipeline Route", a report issued
19 by Northern Engineering Services Company Limited, in
20 October 1975.

21 Q And can you tell me
22 where in that report you set out to design flows for
23 each of the distributor channels?

24 A On page 8.

25 Q Thank you sir. My
26 advisors had difficulty finding it, and now you've
27 pointed the direction. Now Mr. Purcell, there's two
28 or three questions for you. When you moved Compressor
29 Station 08 from the delta over to Tununuk Junction,
30 did you give consideration to moving Compressor Station

1 07 also?

2 WITNESS PURCELL: No, we've shown
3 just one solution here that does not involve moving
4 07.

5 Q Well, my instructions,
6 Mr. Purcell, and you can tell me whether you agree are
7 these, . is that if you move 07 ten miles east, as well
8 as moving 08 the way you have, you would then have about
9 51 miles between 06, 07 and 08. Are you with me, can
10 agree with me to that point?

11 A I think the problem there
12 is that that would put 07 in the delta, and the whole
13 purpose of this exercise was to move compressor stations
14 out of the delta. I suppose otherwise your calculation
15 is correct.

16 Q Well, unless you do that,
17 then isn't this the circumstance; that when the Alaska
18 lateral was fully powered, to 4.5 billion cubic feet,
19 you will have to add compression at either 07 or 08?

20 A The movement of the station
21 to Tununuk Junction, the same size of station that was
22 at CD-08, would somewhat limit the flow of the Prudhoe
23 Bay lateral when it became fully powered. It would
24 limit it by 1½%, if nothing were done. Now the design --
25 it's difficult to give a simple answer to the question
26 because it involves the delta gas as well as the Prudhoe
27 Bay gas. For example, that restriction 1½% could be
28 removed by a little bit more looping south of Tununuk
29 Junction, or by more horsepower at CD-08, or by more
30 horsepower at MD-01, the next station downstream.

19978

Cooper, Hollingshead, Williams,
Manning, Clark, Fulcell
Cross-Exam by Gibbs

1 Q Well, one of those three
2 alternates is going to have to be done when the
3 Alaska line is operating at full capacity. Isn't that
4 so?

5 A One of those three
6 alternates would have to be done to avoid that 1½
7 throughput penalty.

8 Q Now Mr. Williams, my last
9 series of questions; greeted with a smile by Mr.
10 Williams. Mr. Williams, who is going to ensure that
11 all of the plans and proposals and assertions of what
12 will be done in this cross-delta route that has come
13 out through this panel, are actually going to take
14 place during construction? And I follow that by this
15 question. Is Northern Engineering Services going to
16 manage the construction of the Alaska lateral?

17 WITNESS WILLIAMS: Not with
18 the contract as it exists now, Mr. Gibbs, between
19 Northern Engineering and Canadian Arctic Gas.

20 Q No. And at sometime
21 there was a thought or suggestion that a company called
22 Northcan would be construction manager. Am I correct
23 in that?

24 A I don't --

25 MR. MARSHALL: I don't know
26 that Mr. Williams can really speak for what Arctic
27 Gas's plans were with respect to hiring a construction
28 manager.

29 MR. GIBBS: All right, then,
30 can I go this far Mr. Williams, that as far as is

1 presently known, no one on your panel with you will be
2 part of the construction management group?

3 A As far as I know now,
4 Mr. Gibbs, with the -- that doesn't necessarily mean
5 that Northern Engineering would not have a part in
6 the quality control of the pipeline. The contract
7 does envisage inspection services by Northern Engineering.

8 Q Well, my concern sir,
9 and I repeat and ask you whether you can give some
10 assurance on this, is how do we know that what is said
11 will be done? What is said in these proceedings, and
12 are on the -- in the transcripts, will in fact be done?
13 Because isn't it a distinct possibility that the people
14 who are doing are not those who have
15 been here speaking?

16 MR. MARSHALL: Mr. Gibbs, with
17 respect to the first part of your question, I think
18 Mr. Horte has, on the occasion of his testimony here,
19 previously indicated that Arctic Gas will do what the
20 witnesses that have been called before the Inquiry,
21 had undertaken would be done. That was said in the
22 evidence. I don't know that you can get any further
23 than that with someone who's an employee of Northern
24 Engineering Services. Probably you're going to have
25 to ask a policy witness for Arctic Gas how they're
26 going to ensure that the various undertakings given
27 to the Inquiry and the National Energy Board and so
28 on are going to be met.

29 MR. GIBBS: Well sir, I don't
30 recall Mr. Horte having made that statement here, and

1 it
2 if is there in the transcripts, then I ought not to have
3 engaged in this exercise, but if my friend knows it's
4 there and is able to point me to it, all well and good;
5 if it isn't, then I expect that he will be even more
6 firm in his offer to produce Mr. Horte so we can get
7 that assurance.

8 THE COMMISSIONER: I take
9 it from what you've said, Mr. Williams, that Northern
10 Engineering has not so far been retained to manage the
11 project.

Cooper, Hollingshead, Williams,
Manning, Clark, Purcell,
Cross-Exam by Gibbs
Cross-Exam by Lane
A Not as construction

managers.

Q Right, has Northcan
been retained as construction managers, do you know?

A I don't know.
MR. GIBBS:

Q But, may I ask one
further question. But do you know, Mr. Williams, whether
Northcan is still in existence or not?

A No sir, I don't.

MR. GIBBS: Those are all of
my questions sir.

CROSS-EXAMINATION BY MISS LANE:

Q I'd like first --
I'd like first to direct your attention to the summer
work schedules for the five delta crossings that you've
indicated. Do you expect to use one or two or more
crews for the summer construction on the East and
Langley Channels?

WITNESS WILLIAMS:

A I would see two dredging
crews, Miss Lane, and probably one pipeline construction
crew could handle both crossings and we're talking
about Langley and East Channel.

Q Yes.

A Yes.

Q Which sequence will they
be handled in? Or is there a sequence? Will they
be handled simultaneously?

A I would certainly think
that the East Channel would be done first because it's
part of the main supply line from Taglu which is

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Lane

1 scheduled to go onstream a year earlier than the
2 Prudhoe Bay lateral.

3 Q In the second work
4 season when you're -- you've indicated you'll be
5 constructing the pipeline crossing in the West Channel,
6 Shallow Bay and Middle Channel, will there be more
7 than one crew involved in those constructions?

8 A Yes, I would see more
9 than one crew.

10 Q How many?

11 A I would think two.

12 Q Two. Am I correct in
13 assuming then that there will be one crew doing the
14 smaller channels and one doing the larger?

15 A No, there'll be some
16 mobility in there because of this particular problem
17 with Shallow Bay that the three crossings would have
18 to be scheduled to try to best satisfy the environmental
19 concerns in that area.

20 Q Could you give some
21 indication as to the season or the time of the year
22 that you plan to be working in the West Channel?

23 A It would ^{be} between mid-June
24 and mid- or the latter part of September.

25 Q You've made no judgment
26 -- it could be any one of -- any time during those
27 months?

28 A Yes, for all three of
29 those crossings.

30 Q Will people from all three

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Lane

1 crews work on all three channels or --

2 A That could happen.

3 Q Or two crews, I think you
4 said. I know you've been over this to a certain
5 extent with Mr. Gibbs, but it was a little bit spread
6 out and I wondered if you could go through again, the
7 timing that you plan to use for the various stages of
8 construction. Can you tell me if you plan to do any-
9 thing preparatory to actual dredging work or mobilization
10 before spring breakup?

11 A Yes, the construction of
12 the work pads would have to -- would be done ahead of
13 that period, probably the winter immediately preceding
14 the pipeline construction.

15 Q Would you do anything
16 that could be classified as mobilization before the
17 breakup period?

18 A Sure. The dredging
19 equipment, for instance, would be in the area ready to
20 go as soon as breakup permitted. Construction camps
21 would be put onto the site. The construction camp
22 required for the winter construction would be put at
23 the site in the summer preceding the winter construction
24 period.

25 Q All right. If you've
26 got from mid-June as your breakup point and to mid-
27 September as your freezeup point again --

28 A Roughly, yes.

29 Q Once you've established
30 breakup and you're ready to go, how much time do you

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Lane

1 need to prepare yourself before you can begin dredging,
2 in terms of days?

3 A Well, as soon as the
4 dredge got there and had the necessary people to operate
5 it, it could start right away, Miss Lane. I don't see
6 a long period -- a day or two, sort of thing.

7 Q It could be as much as a
8 week?

9 A Well, get fouled up with
10 weather, I suppose it could drag out like that.

11 Q Now you've indicated
12 that the dredging itself, if nothing goes awry, it
13 take 17 days to cross one way for one ditch and 17
14 days to go back for the second or -- for a total of
15 approximately 34 days, is that correct?

16 A On Shallow Bay, yes.

17 Q I'm sorry, yes, on
18 Shallow Bay.

19 A Yes.

20 Q How much of the prepara-
21 tion for the pipestringing will go on while the
22 dredging is being accomplished on Shallow Bay?

23 A How much of the prepara-
24 tion of what?

25 Q For the pipestringing.
26 Maybe I'm not using the right word.

27 A It would go on simultaneous-
28 ly.

29 Q Once the dredging is
30 complete, is there any work that has -- will be done

Cooper, Hollingshead, Williams,
Hunting, Clark, Turcell,
Cross-Exam by Lane

1 between the time of actual winching the pipe out and
2 the completion of dredging. Is there any time in there
3 that you're going to need for transition time to prepare
4 to do the work?

5 A No.

6 Q On Shallow Bay, how much
7 time do you anticipate for completion of pipestringing
8 and floating of the pipe and getting it into place?

9 A I think that's a number
10 that I promised to give Mr. Gibbs. I've speculated
11 on two or three days to complete the pull.

12 Q You speculate two or
13 three days?

14 A To complete the pull.

15 Q Does that include
16 lowering the pipe into place or -- and anchoring and
17 welding it -- or anchoring it too? Or will that --
18 would that entail further time?

19 A No, on the shore the --
20 on the shoreline on the work pads, the pipe will be
21 welded up in strings.

22 Q Yes.

23 A -- and will be concrete
24 coated and it will be moved into the trench in
25 sections and pulled in sections and the weld between
26 the sections where there -- you know, I think I
27 suggested 10 to 15 hundred feet long, will be made.

28 Q I understand that. In
29 my mind, we're now at the stage where this pipe is
30 floating in the trench and I want to know from you, will

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Lane

1 it take -- the two or three day estimate that you
2 gave me, does that include the time for lowering the
3 pipe, getting rid of the floats and anchoring it, or
4 is that going to entail further time?

5 A There might be -- there
6 could be another day involved in removing the buoyancy
7 tanks which would be followed by backfilling.

8 Q And --

9 A -- partial backfilling.

10 Q How long do you estimate
11 for anchoring and backfilling?

12 A I'm not sure what you
13 mean by anchoring. Have we discussed much about
14 anchoring?

15 Q Weighting.

16 A Weighting? Well that's
17 done ahead of time.

18 Q That's accomplished by
19 the concrete is it?

20 A Yes.

21 Q O.K. All right, backfill
22 then.

23 A I think that was another
24 number that Mr. Gibbs asked for.

25 Q Did you -- I -- I recall
26 you discussing it, but I don't remember what estimate
27 of time you gave him.

28 A I don't think I gave --

29 Q You didn't ^{give} him even an
30 estimate there?

1 A I don't think so. The
2 estimated time required for backfilling.

3 Q Can you give me an
4 estimate?

5 A Oh, I'd rather take it
6 from our work sheets, Miss Lane.

Cooper, Hollingshead, Williams,
Manning, Clark, Purcell,
Cross-Exam by Lane

1 Q It's your opinion that
2 there is no transition time needed to prepare for
3 different activities between each of these stages, is
4 -- do I understand you correctly?

5 A Not an extended period.
6 You know, we could be a day.

7 Q A day between each of
8 the activities?

9 A Oh, between, if you're
10 talking about between the time that the pipe is
11 installed and when backfilling starts and I could
12 see a day getting set up to do that, yes.

13 Q In a general
14 way, does backfilling take the same amount of time
15 as digging the trench did in the first place; less or
16 more?

17 A Less, and the reason
18 it's less is that we don't think it's necessary to
19 completely backfill, just enough to assure that the
20 pipe is going to stay there once it's been placed.
21 That natural backfilling will take place after that.

22 Q You anticipate beginning
23 to dredge on approximately June the 15th?

24 A I'm sorry, I missed part
25 of that.

26 Q I'm trying to recall
27 whether or not you said you anticipated that you
28 could begin dredging on June the 15th.

29 A That's a good average
30 number, I think, Miss Lane with respect to the clearance

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Lane

1 of the ice in Shallow Bay. We're still talking about
2 Shallow Bay, are we?

3 Q Yes. Am I correct in
4 assuming that you would be prepared to dredge at any
5 time between June the 15th and September the 15th,
6 approximately?

7 A The -- I would think that
8 one would try to get in just as quickly as possible to
9 get started, Miss Lane. If the bay was clear on
10 June the 10th, I would recommend starting then, for
11 instance.

12 Q In case that all goes
13 well, I have a total here of approximately 48 days,
14 on your rough estimates and that's not including the
15 time for dredging which you haven't been able to give
16 me an estimated time and we've calculated as approximately
17 90 days between the time of breakup and freezeup
18 according to your calculation of when those two events
19 occur. Presuming that you ran into problems with
20 weather or environmental constraints such as whales
21 or that sort of thing, how many days do you consider
22 that you can afford to lose, that is stop and wait
23 for these things to clear up and still complete the
24 necessary work in one season?

25 A Well, in the estimate
26 that we arrived at for 17 days for dredging each
27 channel, I've put in a pretty fat allowance in that for
28 weather and unseen -- other unseen difficulties. The
29 -- about 40 percent reduction from the theoretical
30 capacity of the dredge. I think that's a conservative

number that we're working with with respect to weather and other unforeseen circumstances. Now, the environmental problem, I think you'll find for the next panel that maybe there's a bit of a difference of opinion between those panelists and that situation hasn't been finalized yet.

Q You based your allowance for environmental concerns and weather concerns without really considering the controversy put forward by the environmentalists then, is that correct?

A No.

Q It's your judgment on how long you'd have to wait on environmental or weather problems?

A Well, at one time, we were talking about not starting construction in Shallow Bay until mid-July as the time when the whales generally vacate the area. With the 48 days that you've calculated, that still allows the installation of Shallow Bay between mid-July and mid-September, with a little -- still a little bit of float.

Q If you -- if the unforeseen were to occur, and you were seriously delayed, would you stop and continue construction the following year? For example, is there any kind of activity that could be left once it's started and continued the following year?

A Oh, for instance, the backfilling is not mandatory. It's insurance. It's very frequently in river crossings, they aren't -- they

Cooper, Hollingshead, Williams,
Dinning, Clark, Farrell,
Cross-Exam by Lane

1 are not backfilled. They are left to backfill naturally.
2 Because of the magnitude of this system, I would sure
3 like to see some backfill over the line.

4 Q Well, I understand that
5 you've juggled your construction crews and scheduled
6 things so that you can accomodate things such as
7 whales in Shallow Bay, but are there any critical
8 operations that once they've started, with even
9 within a construction season, that you can't interrupt
10 even to accomodate whales?

11 A Well, if you're in the
12 middle of pulling the pipe into the trench, it would
13 sure be difficult to shut that operation down in the
14 middle and try to carry on the next year. That would --

15 Q Well, even within that
16 one season, is that one of the critical operations that
17 couldn't be stopped?

18 A Certainly, it wouldn't
19 be -- it would be far from being desirable to stop it
20 once you've started that work, it would -- there would
21 real urgency to get it completed that is, the pipe
22 pull.

23 Q Are there any other
24 operations you can foresee being difficult to stop
25 once they've begun?

26 A Oh, the excavation itself
27 it could be stopped, if you had an extended waiting
28 period shut-down, then probably you'd have to do a
29 fair bit of it over again and there will be some
30 siltation. Before we leave the environmental aspect, I

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Lane

1 did say that at one time we were considering not
2 starting the Shallow Bay until mid-July. Now it
3 seems that the possible concern with respect to the
4 snow geese in the fall might be a greater concern
5 than the whales, so that schedule for Shallow Bay
6 could be reversed, but I'd suggest you discuss it with
7 the next panel.

8 Q Would it be possible
9 to follow up your suggestion if you had to accomodate
10 both whales and birds which happen to be at opposite
11 ends of the seasons involved?

12 A It would be extrememly
13 difficult, Miss Lane. I could almost say for sure
14 that there wouldn't be any chance of getting two lines
15 in. The possibility of getting one line in if you were
16 restricted from early July, say, till late August,
17 I think you could get one line in, two would be very
18 difficult. That would mean coming back the next year.
19 It's not, from a construction aspect, that's going to
20 cost a little more to come back the second year, but
21 again, the environmental people don't -- would like to
22 see it restricted to one year.

23 Q In Dr. Gunn's evidence,
24 he indicated that he would prefer that construction
25 on Shallow Bay be done in the winter time. Have you
26 examined that possibility at all?

27 A Yes, we have.

28 Q What were your conclusions?

29 A My conclusions are that
30

19993

Cooper, Hollingshead, Williams,
 Minning, Clark, Purcell,
 Cross-Exam by Lane

1
 2 you'd probably avoid some disturbance to wildlife,
 3 but I would be concerned about the men that would have
 4 to work on the ice in the wintertime. I would think
 5 that there would be a good chance of losing lives
 6 trying to do it in the wintertime. However, a possibili-
 7 ty that we haven't ruled out is that part of Shallow
 8 Bay could be installed in the wintertime. The eastern
 9 half of Shallow Bay is very shallow. Where men's
 10 lives or people's lives would not be endangered, --

11 Q Could you elaborate a
 12 little more on the disadvantages to winter construction?
 13 Why is it dangerous?

14 A Because the maximum water
 15 depth in Shallow Bay is 15 to 17 feet and if you
 16 have four to five feet of ice on the Bay, the excavation
 17 would then, in the wintertime have to be done with a
 18 backhoe that first has to break the ice, do the
 19 excavation, put the spoil material up on the ice
 20 and there is a possibility that the people working
 21 on the hoes, if the ice gave away -- if they sink into
 22 15 feet of water, could perish. Then the other aspect
 23 is installing the pipe, if you were successful in
 24 trenching, the line in the wintertime through the --
 25 from the ice, then you still have to get a -- lower the
 26 pipe into the ditch from the ice and that would require
 27 some fairly substantial lifts and there would be a
 28 good chance of the ice breaking then. Mind you, there
 29 is a possibility that it could still be pulled in
 30 under the ice in the wintertime, but that would be a
 fairly hairy operation.

Cooper, Hollingshead, Williams,
Hanning, Clark, Purcell
Cross-Exam by Lane

1 Q Aside from the environmental
2 aspects that you've mentioned, are there any advantages
3 to winter construction from an engineering point of
4 view that you haven't noted, that you could note now?

5 A We're still talking
6 about Shallow Bay?

7 Q M-hm.

8 A The -- constructing the
9 eastern shallow section that we mentioned earlier,
10 there's two to five feet of water, of which most --
11 pretty near all of it would be frozen by sometime in
12 January, it wouldn't be too bad constructing that
13 portion of it in the wintertime. That would not be
14 an engineering difficulty. But then if you left the
15 balance of Shallow Bay to be done in the summertime,
16 with dredge equipment, then there's the problem of
17 making the tie in between the section that you'd
18 installed in the wintertime, and the section that you
19 pull in in the summertime, and this would require
20 probably a dyking operation around the area that has
21 to be tied in, and pump the water out so that you could
22 make that tie in on dry land. That would be a fairly
23 difficult operation, not impossible, but difficult.

24 Q If for some reason the --
25 it was a government requirement that if you wanted to
26 cross the delta at all, you had to use the Barry
27 proposal, which you've marked up on your map behind
28 you there, would you consider, would you still
29 consider crossing the delta that way preferable to
30 the original prime route?

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Lane

1 A This is the lower solid
2 blue line, Miss Lane, or the blue-black line?

3 Q Well let's start with
4 the line proposed by Dr. Barry, and then perhaps we
5 can try the compromise line that you reached in your
6 discussions in February with him. Would you still
7 prefer to cross the delta, if you had to use the line
8 proposed by Dr. Barry, would you still prefer it to
9 the selected prime route?

10 A Well we sure haven't tried
11 to run out the costs on the Barry route, Miss Lane.

12 Q Well I understood that
13 one of the reasons you rejected the Barry route was
14 because you had done some cost estimates and realized
15 that it would be more expensive than the one that you --
16 the red line that you've already drawn. So you must
17 have some vague idea of the cost.

18 A Sure, it's 10 miles
19 longer, and I know that 10 miles of pipe in that area
20 is fairly expensive, particularly twin lines. But
21 we haven't run out the detailed cost, but I know it's
22 a substantial amount. If you want a rough guess, I
23 could give it to you.

24 Q Well I'm not -- I'm
25 interested in whether you would still -- you would feel
26 that the selected prime route is preferable to that
27 crossing?

28 A YES.

29 Q The original selected
30 prime route.

1 A Oh, no I would suspect
2 that the Barry route would be less costly than the
3 originally filed plan route that circumvents the delta.

4 Q Mr. Williams, yesterday
5 Mr. Gibbs asked you whether or not the considerations
6 that caused Arctic Gas to reject an offshore line from
7 Prudhoe Bay were still considerations that you felt
8 applied, and you indicated that -- am I correct in
9 my understanding that you felt they did not apply to
10 Shallow Bay, but that they still did apply to the
11 Beaufort Sea?

12 A Yes.

13 Q Am I also correct in
14 saying, or assuming, that these largely are concerned
15 with the movement of ice in the Beaufort Sea, and the
16 inability of preserving the integrity of the pipe,
17 because of that?

18 A Yes, and the difficulty
19 in repairing, resulting in long periods of outage.

20 Q Well, it's my
21 understanding that should you be granted a right of
22 way and build a pipeline, that the amount of gas and
23 oil exploration and offshore drilling in the Beaufort
24 Sea will increase, and in the community hearing in
25 Tuktoyaktuk, it was either Mr. Hnatiuk or Mr.
26 Horsfield, I'm not sure which one, and I don't happen
27 to have the transcripts here, told the Commission that
28 a firm called Brown had conducted an investigation
29 and that had indicated that lines running from the
30 wells underground and under the Beaufort Sea were

Cooper, Hollingshead, Williams,
Manning, Clark, Purcell
Cross-Exam by Lane

1 feasible. Given your agreement with Arctic Gas reasons
2 for rejecting a pipeline offshore, would you agree with
3 that comment?.

4 A Yes I would.

5 Q Could you outline your
6 reasons please?

7 A Well, again the
8 situations are not comparable. A substantial -- my
9 understanding anyway is that a substantial part of the
10 drilling that will be done, that has been done and
11 will be done in the Beaufort Sea is in very shallow
12 water, and the possibility of deep ice scour then does
13 not exist as it does off the coast of the national
14 Arctic Wildlife Range in Alaska.

15 In addition to that, a small
16 diameter line, say running from a well to a gas plant,
17 is not a critical operation like a main transmission
18 line, a 48 inch main transmission line running from
19 Prudhoe Bay to Richards Island; that if that main
20 transmission line becomes damaged and inoperative,
21 you shut off the total gas from Prudhoe Bay, whereas
22 from a single well, or even a battery of wells in the
23 Beaufort Sea, it doesn't foul up the whole operation,
24 it's just a small part of it.

25 Q It doesn't foul up the
26 whole operation, but it may foul up the Beaufort Sea.
27 What I'm really asking is, aside from whether or not
28 the operation can continue, is the risk to the breaking
29 of that line greater than the risk to your line in
30 Shallow Bay, because of the reasons you outlined with

Cooper, Hollingshead, Williams,
Hanning, Clark, Purcell
Cross-Exam by Lane

1 the problems of ice in the Beaufort Sea?

2 A I really don't know.

3 THE COMMISSIONER: What was
4 the first point you made? I followed your second
5 point, but what was the first point you made in
6 response to Miss Lane's question?

7 A Well, the proposition
8 that's filed in the alternative Corridor Report, was
9 based on a line in twenty to thirty feet of water,
10 outside of the islands, which generally parallel the
11 north coast. If you're outside the islands, then
12 you're subject to scour, by pack ice that can be very
13 very thick, and has tremendous momentum if it's blown
14 onshore, and can cause deep, deep scouring. That
15 situation cannot occur in Shallow Bay, because the
16 water is so shallow in the bay itself, and outside
17 the bay, that ice with deep keels cannot penetrate the
18 area.

19 THE COMMISSIONER: Right. Yes
20 I understand. Sorry, I should have been paying closer
21 attention. By the way that firm, was a firm called
22 Brown & Co., and they are a firm of European engineers
23 that did a feasibility study for the Arctic Petroleum
24 Operators Association on pipelines from deep water in
25 the Beaufort Sea, bringing gas to a main trunkline.
26 I think that was the report you were thinking of,
27 Miss Lane.

28 MISS LANE: I believe so.

29 THE COMMISSIONER: In spite
30 of the fact that they were a European firm studying

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Lane

1 ice conditions in the Beaufort Sea for Canadian
2 operators, excited a certain amount of hooting in
3 Tuktoyaktuk, I may say. The suggestion was made,
4 what could they possibly know about the Beaufort Sea.
5 We still haven't been advised what they did find out
6 about it.

7 MISS LANE: If we could
8 go back to the channel crossings now. During
9 construction of summer crossing of Middle or West
10 Channels, is there any time when the entire channel
11 would be blocked?
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

Cooper, Hollingshead, Williams,
Manning, Clark, Fincell.
CROSS-Exam by Lane

1 A Be blocked with con-
2 struction equipment or excavated material or -- no.
3 The answer is no.

4 Q Is there any time when
5 say local boat travel would be entirely impeded?

6 A I would say no.

7 Q That means that there is
8 no time when canoes or power boats would not be able
9 to pass.

10 A I can't visualize any
11 period of time, no.

12 Q During your plans for
13 construction in these areas, have you been made aware
14 of the use made by these channels by local people?
15 Have you taken that into consideration, the seasonal
16 use?

17 A I'd -- not those two
18 channels, Miss Lane. There has been some discussion
19 with respect to Moose Channel, I recall but not Middle
20 and West Channels.

21 Q You haven't been advised
22 that with channels, that particularly well travelled
23 channels.

24 A No and I don't think the
25 summer operation would interfere with that traffic.

26 Q I have a couple of matters
27 that I want to talk to you about; the 20 of the 36
28 inch pipeline. When you use the term "insurance", do
29 you use this term as insurance against normal minor
30 breakages in the pipe or normal wear and tear on a pipe,

Cooper, Hollingshead, William,
Rimington, Clark, Purcell
Cross-Exam by Lane

1 or are you using it as insurance against a catastrophic
2 event -- a larger, major break, when you use that term
3 "insurance"?

4 A The latter. I just
5 hesitated because you talked about normal small
6 failures or normal wear and tear. There really aren't
7 any normal small failures, I don't think, Miss Lane.

8 Q So any break is considered
9 to be a catastrophic event, is it?

10 THE COMMISSIONER: It's
11 considered serious, isn't it?

12 A Pardon me.

13 Q It's considered serious.

14 A Oh, a pinhole leak in
15 a pipeline -- I wouldn't consider serious. It's
16 something that has to be fixed. But, I was just saying
17 it's really -- when you say the normal thing like it
18 was an every day occurrence. I just wanted to dispell
19 that idea that it really isn't an every day occurrence
20 to have a minor hole in a pipeline. It's unusual also,
21 but the insurance is against prolonged outage.

22 MISS LANE:

23 Q What kinds of events do
24 you foresee causing a problem that you need this
25 insurance against?

26 A Well, historically,
27 most failures originate with man-made activities. Give
28 the ignorance of the line being there and excavation
29 or what-not going on around the line and that's the
30 -- that's the most common cause of pipeline failures.
Other things would be landslides, can take --

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Lane

1
2 Q Landslides in the Shallow
3 Bay?

4 A No, I --

5 Q Well, I'm talking about
6 the two 36 inch pipes. I want to know what you're
7 insuring against there. What kinds of things are
8 you insuring it against there?

9 A Any kind of operation
10 or happening that took the pipeline out for a
11 prolonged period.

12 Q Do you foresee any non
13 man-made?

14 A Pardon me.

15 Q Do you foresee any non
16 man-made forces interrupting or breaking the pipe?

17 A Oh, that -- yes, that
18 possibility, you know, always can happen.

19 Q Well, you've indicated
20 that these pipes are 200 feet apart.

21 A Yes.

22 Q What's to stop a
23 catastrophic event breaking both of them? They're
24 not very far apart. Is there any real insurance
25 involved when you've got something of the magnitude
26 that you say is required to break the pipe? It seems
27 to me there's a likelihood of them both being broken
28 is fairly real.

29 A Not if you take the
30 case that I mentioned of a man-made situation that

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Lane

1 ruptured the pipe. It would be difficult to see that
2 happening simultaneously to two lines 200 feet apart.

3 Q Dr. Hollingshead, on page
4 2508 of the transcripts, you stated that there was no
5 possibility of an ice jam developing at points along
6 the cross-delta route. Are you still of that opinion?
7 Excuse, me, across -- in Shallow Bay?

8 WITNESS HOLLINGSHEAD: Yes,
9 I would -- I would say so. I think the evidence is
10 the evidence that we've collected and the observations
11 we've made over the past three years and our advice
12 from Mr. Nuttall who is an expert in river ice
13 mechanics, etc.; indicate that there's no real
14 possibility of a serious jam in Shallow Bay.

15 Q On page 19049, Mr. Peter
16 Lewis said in evidence that he had flown over Shallow
17 Bay and he did so during times when there were large
18 ice jams and he suggested that there could be scour
19 associated with them, although he wasn't certain of
20 the magnitude. Do you have anything to comment -- to
21 say about that particular statement in light of your
22 opinion that there is no possibility of an ice jam?

23 A Well, I would just say
24 that I'm not really sure how he's -- you know, how he's
25 defining ice jam or what he takes to be an ice jam.
26 It seems to me that with the low relief in the vicinity
27 of Shallow Bay there that if they're even was any --
28 anything that resembled an ice jam, that the backup
29 would flood the surrounding terrain and the associated
30 scour in the channels would be very minimal.

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Lane

1 Dr. Cooper may be able to add something to that.

2 WITNESS COOPER: Miss Lane, I
3 think there's maybe some confusion on the word "scour".
4 When we talk about ice jams, there are two types of scour
5 and I noticed in reading the transcripts that these are
6 interchanged without a proper description.

7 In one case it could be a scour
8 that's associated with a piece of ice gouging the bed.
9 In another case it could be scour that results from
10 the erosive forces of the floe that are flowing beneath
11 the jam and because the jam in fact constricts the floe
12 area, the velocity increases and the floe itself scours
13 the bed.

14 Now, in a situation like
15 at Point Separation which we talked about previously in
16 the hearings, this latter type of scour due to the floe
17 beneath the jam was considered to be a very serious
18 design consideration. In any type of jam you can get
19 some gouging of the bed or the banks beside the jam.
20 This gouging would be limited to several feet in depth,
21 and then you get a rolling of the ice cake.

22 With respect to the other
23 type of scour, scour due to the floe underneath the jam,
24 in the delta area you cannot get serious scour due to
25 this because it requires a jam that thickens, that forces
26 considerable buildup of water behind it, and high
27 velocities underneath. Now, in the delta you'll get
28 flow over top and around, before that will happen.
29 Whereas, at Point Separation you've got very high banks.

30 Q So the scour that you say

Cooper, Hollingshead, 20005
Williams, Minning,
Clark, Purcell
Cross Exam by Lane

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

does not occur, is the second, the floe scour?

A That's right, and it could be the most serious if it could occur.

Q Mr. Lewis was -- I've got the reference here, let me read it. The question was by Mr. Goudge:

"What would your view be of the possibility though, of ice scour occurring at breakup in Shallow Bay?

Answer:

" I've flown over Shallow Bay at times when there were large ice jams in Shallow Bay, I think that there is certainly a very definite possibility that scour does occur.

Now, I couldn't make any guess whatsoever on the magnitude of frequency of scour."

Now, that's the first kind of scour that you indicated , the ice scour.

Cooper, Hollingshead, Williams,
Manning, Clark, Purcell
Cross-Exam by Lane

1 A I believe that later in
2 the transcript a correction was made to the testimony
3 of both Lewis and Shearer, I believe, that they were
4 referring to ice scour.

5 Q Well, the question asked
6 him about ice scour, specifically.

7 A Yes, I agree that in
8 Shallow Bay, you could, from an aerial reconaissance,
9 you could quite likely see what appeared to be a large
10 jam in aerial extent. That is the ice floes would
11 come to a stop and would pile up behind, but you would
12 not see a jam that thickened where the ice floes
13 tumbled underneath and constricted the floe area to
14 any great extent.

15 Q Well, ice scour, or
16 gouging, is that not a possible threat to the pipe?

17 A No, I don't think it
18 is, because we're talking about ice floes that are, oh
19 in the order of three feet in diameter. They're not
20 going to be strong at that time, and you might get
21 ice scour of, oh three or four feet on the existing
22 bed or banks of the channel. Our work on the main
23 portion of the Mackenzie River, upstream of the delta,
24 indicated that even when you have the strongest ice,
25 when it breaks up there, I believe six or seven feet
26 would be the maximum ice scour you could get.

27 Q There's a question I wish
28 to ask you about that but I'm going to defer it for
29 a moment.

30 THE COMMISSIONER: Well, would

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Lane

1 this be a convenient time to adjourn, Miss Lane?

2 MISS LANE: Yes, it would.

3 THE COMMISSIONER: Well, let's
4 defer the question until tomorrow morning, and -- 9:30
5 in the morning? All right, we're adjourned until
6 9:30 then.

7 (PROCEEDINGS ADJOURNED AT 4:50 P.M.)
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

347
M835
vol.131
Community

AUTHOR

Canada.National Energy Board

Mackenzie Valley Pipeline-
Inquiry

347
M835
vol.131
Community

CA1
Z 1
-74M21

MACKENZIE VALLEY PIPELINE INQUIRY

Government
Publications

IN THE MATTER OF APPLICATIONS BY EACH OF

- (a) CANADIAN ARCTIC GAS PIPELINE LIMITED FOR A
RIGHT-OF-WAY THAT MIGHT BE GRANTED ACROSS
CROWN LANDS WITHIN THE YUKON TERRITORY AND
THE NORTHWEST TERRITORIES, and
- (b) FOOTHILLS PIPE LINES LTD. FOR A RIGHT-OF-WAY
THAT MIGHT BE GRANTED ACROSS CROWN LANDS
WITHIN THE NORTHWEST TERRITORIES

FOR THE PURPOSE OF A PROPOSED MACKENZIE VALLEY PIPELINE

and

IN THE MATTER OF THE SOCIAL, ENVIRONMENTAL AND
ECONOMIC IMPACT REGIONALLY OF THE CONSTRUCTION,
OPERATION AND SUBSEQUENT ABANDONMENT OF THE ABOVE
PROPOSED PIPELINE

(Before the Honourable Mr. Justice Berger, Commissioner)

Yellowknife, N.W.T.

March 18, 1976

PROCEEDINGS AT INQUIRY

Volume 132

CANADIAN ARCTIC
GAS STUDY LTD.

442 24 1976

LIBRARY

APPEARANCES:

Mr. Ian G. Scott, Q.C.,
Mr. Stephen T. Goudge,
Mr. Alick Ryder and
Mr. Ian Roland for Mackenzie Valley Pipeline
Inquiry;

Mr. Pierre Genest, Q.C.,
Mr. Jack Marshall, and
Mr. Darryl Carter for Canadian Arctic Gas
Pipeline Limited;
Mr. Reginald Gibbs, Q.C.,
Mr. Alan Hollingworth &
Mr. John W. Lutes, for Foothills Pipe Lines Ltd.;

Mr. Russell Anthony &
Pro. Alastair Lucas for Canadian Arctic Resources
Mr. Garth Evans Committee;

Mr. Glen W. Bell and
Mr. Gerry Sutton, for Northwest Territories
Indian Brotherhood, and
Metis Association of the
Northwest Territories;

Mr. John Bayly
or
Miss Leslie Lane for Inuit Tapirisat of Canada,
and The Committee for
Original Peoples Entitle-
ment;

Mr. Ron Veale and
Mr. Allen Lueck for The Council for the Yukon
Indians;

Mr. Carson H. Templeton, for Environment Protection
Board;

Mr. David Reesor for Northwest Territories
Association of Municipal-
ities;

Mr. Murray Sigler for Northwest Territories
Chamber of Commerce.

Mr. John Ballem, Q.C., for Producer Companys;

547
41071
VOT. 12

	<u>I N D E X</u>	<u>Page</u>
1		
2	WITNESSES FOR CANADIAN ARCTIC GAS PIPELINE LIMITED:	
3	Guy Leslie WILLIAMS	
4	Hoyt PURCELL	
5	Garry Wood HOLLINGSHEAD	
6	Miss Gretchen V. MINNING	
7	Richard H. COOPER	
8	John Ivor CLARK	
9	- Cross-Examination by Miss Lane (cont)	20008
10	- Cross-Examination by Mr. Goudge	20014
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Lane

Yellowknife, N.W.T.

March 18, 1976.

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

THE COMMISSIONER: Well we will
come to order. Miss Lane, I think you were in the
midst of a series of questions.

MISS LANE: Yes sir. I
understand Mr. Marshall wants to talk before I do.

THE COMMISSIONER: Oh, right.

MR. MARSHALL: Mr. Commissioner
I thought I should just note that Miss Lane had the
distinction yesterday of carrying us to page 20,000
in the transcript. I've canvassed counsel and it seems
to be the unanimous view that it would be nice if Miss
Lane would supply the appropriate refreshments to mark
the occasion. I think she's agreed to do so.

THE COMMISSIONER: Well, it's
lucky it was Miss Lane who was on her feet when we
reached that page.

MR. MARSHALL: Lucky indeed
for us sir.

GUY LESLIE WILLIAMS,
GARRY WOOD HOLLINGSHEAD,
RICHARD H. COOPER,
GRETCHEN V. MINNING,
JOHN IVOR CLARK,
HOYT PURCELL, resumed

CROSS-EXAMINATION BY MISS LANE:

Q All right. Mr. Peter
Lewis stated at page 19028 of the transcript that the
west side of Shallow Bay is being cut back quite
rapidly. Would any of you like to comment on that

Williams, Cooper, Hollingshead,
Minning, Clark, Purcell,
Cross-Exam by Lane

1 statement?

2 WITNESS HOLLINGSHEAD: Well
3 yes, that's right. We would agree with that. We've
4 made some measurements which indicate that the bank
5 is retreating at a rate in the order of 25 to 30 feet
6 per year.

7 Q Are you taking any
8 measures to deal with this problem on the west side?

9 A Well, this would be part
10 of the final design exercise. The preliminary design
11 of the Shallow Bay crossing indicates that training
12 works would be required. That is certainly one --

13 Q I'm sorry, I didn't
14 understand.

15 A That bank protection or
16 channel training devices would be required to protect
17 that portion of the pipeline. The alternative of
18 course would be to extend the deep burial for greater
19 distance into the bank at the west side of Shallow Bay.

20 Q Mr. Williams, has the
21 winter construction camp been moved to Tununuk Junction
22 as well, as the move of the compressor station?

23 WITNESS WILLIAMS: No. The
24 winter construction camp is still at Middle -- at the
25 work pad area around Middle Channel, Miss Lane.

26 Q How much activity will be
27 concentrated around Tununuk Junction?

28 A Well, not too much at
29 Tununuk Junction. There will be the work required to
30 install the gravel pad for the compressor station that

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Fxam by Lane

1 is required I think in the third operating year. There
2 will be the construction of an airstrip at that
3 location. There will be valve shuttings where the
4 two 36 inch lines come into the 48 inch line from Taclu.
5 I would see the airstrip used to a minor extent during
6 construction to bring in light materials for construc-
7 tion. But during the construction period, there's no
8 large camp there. That's what you were meaning.

9 Q Are you aware that the
10 land close to Tununuk Junction is an area of historical
11 significance to the people of Tuk? There was a
12 document filed with the Inquiry, "Proposed Land
13 Freezes in the Tuktoyaktuk Area", which outlines the
14 areas of historical significance to the people of Tuk
15 that are in the area of Tununuk Junction. Have you
16 been made aware that that is a sensitive area?

17 A No, I haven't and that
18 is Tununuk Junction rather than Tununuk Point that
19 you're --

20 Q I'm advised that it's
21 a general area which encompasses all of that area.
22 The exhibit is C-256. Mr. Carter, I have the Inquiry's
23 exhibit here. I wasn't able to locate our copy. I
24 understand that the concern is that you be aware that
25 that is an area of concern and that not necessarily
26 that anybody wants you to leave that specific spot,
27 but that you're aware that -- of the sensitive areas
28 in the vicinity of Tununuk Junction and Tununuk Point.
29
30

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Lane

1 A Well, Tununuk Junction
2 is, I think, about nine miles -- at least nine miles
3 north of Tununuk Point, Miss Lane, and to answer your
4 question, I'm not familiar with this document.

5 Q Except that now you are.

6 A I'll sure make an effort
7 to read it.

8 Q How often will you require
9 overland or water inspection trips to be done in the
10 cross-delta route?

11 A How often would we require
12 overland and --

13 Q Over water.

14 A -- over water inspection
15 of the cross-delta route.

16 Q I'm sorry, I mean once
17 the pipeline's built.

18 A Yes. The primary
19 inspection would be done with aircraft; if some problems
20 were seen to be developing, a closer inspection would
21 be made of those locations, and again, it would be
22 by aircraft. It is the practice in the south to try
23 to walk the line once a year. This would be pretty
24 difficult on the cross-delta route, but not impossible
25 with small boats to assist personnel across the channels.
26 But I wouldn't see an on-land -- driving on land in
27 the summer months for inspection, Miss Lane, if some
28 repair work is required, then that becomes a possibility.

29 Q Would you expect to see
30 the use of hovercraft or A.T.V's?

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Lane

1 A Yes, I would see that
2 possibility.

3 Q Where will they be staged?

4 A The plan shows such a
5 vehicle stationed at Inuvik.

6 Q And have any studies been
7 done on their noise emission effects on the environment
8 birds, animals, that sort of thing, that you're aware
9 of?

10 A I'm not aware of Arctic
11 Gas doing such a study.

12 Q On page 5419 of the
13 transcripts, Mr. Hurd suggested that divers would be
14 used, and underwater photography for maintenance of the
15 pipe. Mr. Bayly earlier on suggested that in silty
16 water, this photography would be impossible. How do
17 you propose to do regular inspections and maintenance
18 of the underwater portions of the pipe, at this point?

19 A Well, again I think the
20 major inspection of the larger crossings, the first
21 step would be to monitor the bed with -- by soundings,
22 particularly during the summer months to see if changes
23 are taking place. If something is found that needs
24 closer inspection, then that's when people equipped
25 with diving apparatus would be brought in. I wouldn't
26 see that done as an annual activity to inspect the
27 channel bottom -- the major channel bottoms with
28 diving apparatus.

29 Q So you feel that once
30 the divers are brought in, in this circumstance, the

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Lane

1 problem would already have been located? They'd know
2 where they were going?

3 A Yes, I would see them
4 brought in, if some potential problem was developing,
5 for closer inspection.

6 WITNESS HOLLINGSHEAD: I might
7 just add one word to that. I don't know exactly what
8 Mr. Hurd had in mind, but these crews who are in the
9 business of inspecting submarine crossings, sub-channel
10 crossings, are equipped with metal detectors which
11 are effective to ten or -- through at least ten or
12 fifteen feet of sediments, to assist them in their
13 inspection. It's not strictly reliance on visual,
14 visual inspection.

15 Q My last question is
16 directed to you Mr. Williams. You indicated in your
17 discussions with Mr. Gibbs, that you would be hauling
18 snow from lake surfaces. Is that correct?

19 WITNESS WILLIAMS: Yes.

20 Q You indicated that you
21 didn't know the location of the water sources that you
22 would be using, but can you indicate which lakes in
23 the delta you propose to harvest snow from?

24
25
26
27
28
29
30

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Lane
Cross-Exam by Goudge
A No, I can't, Miss Lane.

There are numerous lakes there. There are, I think, a very small number of them that Dr. McCart's crew have looked at where he has concern for fish. These have been pointed out to us. Additional study will be required in that area. But, you know, if you look at the map, it is a very high percentage of water in the delta will be thereby a high percentage of ice covered area in the wintertime. The selection is great in that particular area and I wouldn't foresee a problem in avoiding the lakes where there is a potential problem with overwintering fish.

MISS LANE:
Q That is all the questions

I have.

CROSS-EXAMINATION BY MR. GOUDGE:

Q Mr. Williams, I will be starting with you, sir. You said, as I understood you in your evidence in chief that the cross delta route that we are particularly focusing on today really began with its proponent, Mr. Hemstock. As I understood you, that was essentially the genesis of the idea that you then examined as engineer.

WITNESS WILLIAMS: A Yes, sir.

Q And his route was proposed I take it, given his experience as one that he felt with further examination might prove environmentally acceptable.

A Yes, you would no doubt

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

1 want to discuss this further with Mr. Hemstock on the
2 next panel but my understanding is that environmental
3 information was beginning to come in from the producing
4 companies working in that area at this time, and I think
5 that was the basis of, perhaps of Mr. Hemstock's thought
6 that this would be environmentally, could be environmen-
7 tally acceptable routing.
8

9 Q And you took the line
10 that he tentatively proposed and examined it from the
11 engineering feasibility point of view?

12 A The way I recall it, Mr.
13 Hemstock gave a rough location. We then went to maps
14 and refined the location because of water crosssings and
15 so forth and then studied that route.

16 Q Yes, and the initial
17 attraction to you from an engineer's point of view
18 was that it was shorter and therefore substantially
19 cheaper?

20 A Yes, sir.

21 Q In going from the general
22 line that Mr. Hemstock proposed to your specific sheet
23 drawings, you, I take it, made one particular change
24 at the east end of the line to avoid two difficult
25 river crossings.

26 A Yes, sir.

27 Q So that ~~essentially~~ from
28 the point of view of the engineering input to this, the
29 two key criteria in locating the line that we have in
30 the application today were the cost factor and perhaps

Cooper, Hollingshead, ~~William~~
Minning, Clark, Purcell
Cross-Exam by Goudge

1 the difficulty of river crossings at the east end of the
2 cross delta leg?

3 A I would say that is correct.

4 Q The cost saving I
5 understood you to say earlier was in the nature of
6 180 or 90 million dollars?

7 A I think that is right,
8 Mr. Goudge. I haven't looked at it recently. It is
9 in that order.

10 Q Now, your specific
11 examination in terms of engineering feasibility, I take
12 it, was directed to a relatively narrow strip across
13 the delta as initially identified by Mr. Hemstock?

14 A In, from an engineering
15 aspect, yes.

16 Q You have not, for example,
17 canvassed in engineering terms a wide variety of
18 alternatives that might theoretically be chosen to
19 cross the delta?

20 A Well, the channel crossing
21 work, Mr. Goudge, did incorporate channel, bottom bed
22 soundings for a considerable distance each side of the
23 proposed routing. I think you will see that in the
24 reports that there is bed topography a substantial
25 distance each side of the line that was selected.

26 Q Can you give me a rough
27 figure on considerable distance? That is, are you
28 talking a matter of many miles or is it a matter of a
29 few hundred feet?

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

WITNESS HOLLINGSHEAD: Could
we say several miles?

Q Several miles centred on
the point that is on the proposal, I take it.

A Yes, sir.

Q Would that be true of
the route you have chosen to cross Shallow Bay?

A No, not in the case of
Shallow Bay.

Q Shallow Bay, for example,
was, I take it, analyzed only within relatively narrower
geographical constraints around the specific proposal
you now have?

A Most of the work in
Shallow Bay has been confined pretty well to the vicinity
of the line, yes.

Q So that with the excep-
tion of the three other major channels, your investiga-
tion in engineering terms is directed to the vicinity
of the existing line?

WITNESS WILLAIME: With respect
to detailed field work , such as soil
sampling, and aerial crossing work.

1 That is
2 correct, Mr. Goudge, from a map aerial photography
3 aspect, the examination covered a much larger area.

4 Q Yes, obviously in
5 examining aerial photographs, you can, with one
6 photograph examine a wider area.

7 A Certainly.

8 Q There's no doubt though,
9 that since your proposal at least, we have learned that
10 there are other possible routes across the delta.
11 For example, the Barry route, if I could ^{call} it that and
12 the compromise route, if I can call it that. You'd agree
13 with that proposition?

14 A Yes, I'm sure if two
15 separate engineers looked at the same proposition
16 together simultaneously starting from scratch that it
17 would be very unlikely that they would come up with the
18 same route across there; probably close, but there
19 would be variations.

20 Q Well let me, given that
21 we agree that alternative routes across the delta
22 besides the one you analyzed in detail are possible,
23 let me ask you to turn your attention to the Barry
24 route and compare it to the -- to your application
25 route. As I understood you, Mr. Williams in answer
26 to Mr. Marshall several days ago, you said that one
27 problem you as an engineer have with the Barry route
28 is the difficult crossing in the Langley Channel area.

29 A Yes, I said -- maybe I
30 didn't say, but what I intended to say is from the

Cooper, Hollingshead, Williams,
Manning, Clark, Purcell,
Cross-Exam by Goudge

1 information that we have -- that we've examined --
2 downstream of the Barry route, that is at the twin
3 channel that we moved away from initially plus the
4 work at the wider channel where the red route is now,
5 that it would be our guess that the crossing of the
6 southern extension of Langley Channel where Dr. Barry
7 proposed his route, that there would be a very difficult
8 crossing there. Now, we have no field information to
9 go on at the specific site as shown on the map behind
10 us here.

11 Q Yes, you --

12 A Extrapolating from what
13 we know downstream from there, I would think that that
14 would be a difficult crossing.

15 Q The nature of the difficulty
16 you suspect would be the depth of the river channel?

17 A Yes, and the -- if you
18 check the configuration it's -- the river is a series
19 of bends. There are no straight reaches in that
20 immediate area, so you'd be forced to cross that channel
21 at a bend location where lateral migration is liable
22 to occur.

23 Q An erosion problem?

24 A Yes sir.

25 Q So that from an engineering
26 point of view, using the Langley Channel criteria --
27 criterion, I take it you prefer the prime route to the
28 Barry route, on that criterion alone, dealing only with
29 that criterion?

30 A Yes, and then that would

Cooper, Hollingshead, Williams,
Binning, Clark, Purcell,
Cross-Exam by Goudge

1 based on very limited information.

2 Q Yes.

3 A -- Mr. Goudge.

4 Q Now you point out, as I
5 understood you, one other factor that is relevant in
6 engineering terms to this comparison and that is that
7 the Barry route's crossing of Shallow Bay is shorter
8 than your crossing?

9 A Yes sir.

10 Q I take it you would view
11 that as an engineering advantage favoring the Barry
12 route?

13 A Yes sir.

14 Q So we've now gotten one
15 disadvantage and one advantage.

16 A Not necessarily offsetting
17 one another.

18 Q No, I appreciate that.
19 A third factor that I understood you to refer to was
20 that the Shallow Bay crossing on the Barry route is
21 shallower than the Shallow Bay crossing where you cross.

22 A That is our advise from
23 Dr. Barry and I know no information to argue the point.

24 Q Assuming that's correct,
25 do you view that as an engineering advantage favoring
26 your route or his route?

27 A Dr. Barry's -- favoring
28 Dr. Barry's route.

29 Q Yes.

30 THE COMMISSIONER: What was the

Cooper, Hollingshead, Williams,
Manning, Clark, Purcell,
Cross-Exam by Goudge

1 the first one, the disadvantage of Barry's route?

2 I missed that.

3 MR. GOUDGE: I think, sir, if

4 I --

5 THE COMMISSIONER: It's two
6 to one in favor of Barry but what's the one in favor
7 of Williams?

8 A That's the crossing of
9 this channel here, Mr. Commissioner.

10 Q Oh, yes, yes.

11 A I have a feeling that it
12 would be difficult, but it's just a feeling based on
13 the information we have downstream of that.

14 THE COMMISSIONER: Thank you.
15 Sorry. Carry on.

16
17 MR. GOUDGE: Well it's now
18 two to one in favor of Barry, Mr. Williams. One other
19 factor which --

20 THE COMMISSIONER: All the
21 score is not necessarily to be weighed --

22 MR. GOUDGE: On the same
23 board, no sir.

24 THE COMMISSIONER: No.

25 MR. GOUDGE: I understand that.

26 Q One other factor which
27 was pointed out by Mr. Hemstock but which perhaps you
28 could comment on Mr. Williams is found at page 19750
29 at the transcript and since you didn't say it, perhaps
30 I can read it to you, because it appears to come down

Cooper, Hollingshead, Williams
Minning Clark, Purcell,
Cross-Exam by Goudge

1 on your side, ~~surprisingly~~ enough. Mr. Hemstock says
2 that, there since the Barry route crosses areas with
3 somewhat more relief, bank stabilization would be of
4 greater concern. From an engineering point of view,
5 I take it that is a counter on your side, rather than
6 Dr. Barry's?

7 A Yes sir.

8 Q Yes. Is bank stabilization
9 a problem of general concern in any delta crossing
10 your route or Dr. Barry's route?

11 A Yes sir.

12 Q Yes. I take it there
13 is not a substantial difference though when the bank
14 stabilization problems of the Barry route by comparison
15 with your route?

16 A Just -- I think what
17 Mr. Hemstock says that there ^{would} be more areas where bank
18 stabilization would be required, and more difference
19 in elevation between water level and ground level.

20 Q Yes. Now those are the
21 four criteria that I understood you and your colleagues
22 to apply to the Barry route. Let me come back to the
23 first very briefly. That is, the difficult crossing.

24 A Excuse me, Mr. Goudge,
25 but I think you missed the important one.

26 Q I have no doubt I have.
27 Perhaps you could tell me.

28 A That is that it's ten
29 miles longer.

30 Q I see. Fair enough.

Cooper, Hollingshead, Williams,
Hinning, Clark, Purcell
Cross-Exam by Goudge

1
2
3 Let me address
4 one small point to that, though. I take it you would
5 acknowledge that the additional length is length
6 probably not of twinned pipe, but of single 48 inch
7 pipe?

8 A No, I don't think so.

9 Q It's hard to tell
10 because Dr. Barry hasn't indicated where he would twin
11 but if you assumed twinning across major channels and
12 east of Shallow Bay, doesn't it appear on a quick look
13 that the ten miles would be used up largely west of
14 Shallow Bay and therefore wouldn't be twinned?

15 A That's possible. That --

16 Q It's likely, isn't it?

17 A No, that would require
18 some study, I think Mr. Goudge, to see how far westerly
19 that that twinning should be carried out.

20 Q Well you know --

21 A We really haven't done
22 it.

23 Q Yes, but you have no
24 plans at the moment to twin your route to any extent
25 west of Shallow Bay?

26 A It's twinned to the
27 west side of West Channel and --

28 Q Yes, and you have no
29 reason to believe that--

30 MR. MARSHALL: Let him finish

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Goudge

1 his answer.

2 MR. GOUDGE: Sorry.

3 A The main reason that we
4 didn't extend the twinning on -- beyond that is that
5 it's our belief that the -- that flooding does not
6 occur to the same extent west of West Channel. Now
7 down farther south in Dr. Barry's route, I don't know
8 what the situation is there on the west side of Shallow
9 Bay.
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Goudge "

1 Q You have no reason
2 to pass an opinion as to whether it would be necessary
3 to twin further west on Dr. Barry's route than on
4 your route?

5 A I have no information
6 to base an opinion, no.

7 Q Now let me come back to
8 the first point that I mentioned very briefly, that's
9 the difficult Langley Channel situation on the Barry
10 route. Have you in any way examined the vicinity
11 of the Barry route, at that point, to determine whether
12 it would be feasible with some movement of the Barry
13 route, to find a point where either there was no
14 depth of channel problem, or no bend of channel problem.

15 A Well, it's quite simple
16 to look at the map and photographs Mr. Goudge, to answer
17 your question with respect to bends, and as I said
18 before, they're very difficult to avoid.

19 Q How far would you have to
20 move the west end of the Barry route -- the east end,
21 sorry, of the Barry route, to get out of that problem?

22 A Well, just a quick look,
23 it would appear you'd have to go north to where the
24 solid red line, the prime route, crosses Langley Channel,
25 or go farther south, and suffer additional major
26 crossings of other channels.

27 Q Now finally, Mr. Williams,
28 on this point, I think you or perhaps Mr. Hemstock
29 indicated at page 19750 of the transcript, yes it was
30 Mr. Hemstock that -- the Barry route is not very

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Goudge

1 dissimilar from a route proposed by Dr. Gunn to you
2 people. Is that correct?

3 A I've hear Mr. Hemstock
4 say that, yes.

5 Q Yes. Was that a route
6 that was proposed to N.E.S. for examination in
7 engineering terms?

8 A Well, we had a meeting
9 three or four weeks ago, Mr. Goudge, that Mr. Webb
10 and Dr. Gunn, and Mr. Hemstock were at, and at which
11 the Barry route was discussed, and I'm sure at that
12 meeting Dr. Gunn said that that would help his
13 concerns.

14 Q Yes, but I take it --

15 A I don't recall seeing
16 a map that Dr. Gunn gave to N.E.S on this subject. Now
17 it may have happened, but I don't recall seeing it.

18 Q Yes, and over your
19 association with the project, N.E.S. has not been
20 engaged in the past in an examination of any Dr. Gunn
21 route, so to speak.

22 A THat is correct. From
23 an engineering aspect, yes.

24 Q Yes sir. And no such
25 route has been proposed to you by Arctic Gas for
26 examination?

27 A No sir.

28 Q Now, aside from the Barry
29 route, there appear to be really two other players
30 besides your own on the scene. One is the compromise

Cooper, Hollingshead, Williams,
Fanning, Clark, Purcell
Cross-Exam by Goudge

1 route you've outlined, and one is the circum-delta
2 route, which I take it has been formally dropped from
3 your application in preference to the cross-delta route.
4 Now let me ask you to keep those four routes in mind.
5 The application across the delta, the Barry route,
6 the compromise route, and the circum-delta route.

7 MR. MARSHALL: Just before
8 Mr. Williams deals with that, Mr. Goudge, I think with
9 the original prime route that Dr. Gunn describes as a
10 circum-delta route, Arctic Gas has opted in favour of
11 the cross-delta route in preference to that. I think
12 the position was that that circum-delta route, if you
13 like, was left as an alternative. It's not the preferred
14 route.

15 MR. GOUDGE: Well it's a
16 small matter sir, but my reading of the consolidation
17 filing was that it was not a proposal of an alternative,
18 that Arctic Gas is putting forward, but an application
19 for a route change, and they are now saying as they
20 did with Fort Simpson, this is the route we want, we
21 don't want any other. It's not the case that it's an
22 alternative proposal. Now, that's a matter of form,
23 but if my --

24 THE COMMISSIONER: But didn't
25 you just say that? Or am I --

26 MR. MARSHALL: I think the
27 difference is this. There were a number of alternatives
28 that were considered and rejected as being unacceptable
29 for various reasons. The circum-delta route, if we
30 can use Dr. Gunn's term, remains an alternative in the

Cooper, Hollingshead, Williams,
Pinning, Clark, Purcell

1 in the sense that Arctic Gas is satisfied that it can
2 be built -- it's feasible to build it and it can be
3 built in an environmentally acceptable basis. In that
4 sense, it remains as an alternative route. It's not
5 the route of choice.

6 THE COMMISSIONER: It bears
7 the same relationship to the cross-delta route, as
8 the interior route does to the coastal route.

9 MR. GOUDGE: No sir, no sir,
10 that's the point, I think. It does not. Now I'm not
11 sure what difference it makes, but to read from the
12 applicant's own volume, at page 2 of the Consolidation
13 Filing, paragraph 2 says,

14 "This third amendment to the application (a) confirms
15 applicant's election to amend it's applications
16 to adopt the cross-delta routing, which was
17 filed as an alternative to its applications on
18 August 15, 1975."

19 I take that to mean that the
20 cross-delta route has advanced in status, to an
21 amendment to the formal route, from the position of
22 being an alternative.

23 THE COMMISSIONER: Yes.

24 MR. MARSHALL: That's okay.
25 You're on track so far, Mr. Goudge.

26 MR. GOUDGE: Good, okay. If
27 you could keep the four in mind, Mr. Williams.

28 WITNESS WILLIAMS: I'm just
29 a little concerned about your terminology of the
30 compromise route. I don't think anyone was compromised

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Goudge

1 in selecting that alternative, Mr. Goudge. Dr. Barry
2 came to our office and he said that the route that he
3 roughed out on a map at this hearing that was circulated
4 was done in a hurry, and after he'd looked at it a little
5 more he thought that maybe the shorter alternative
6 would fit the bill, from his aspect. There was no
7 coercion or compromise.

8 Q I'm sure there wasn't
9 sir, and I wasn't attaching any significance to the
10 use of the term "compromise," I just had no other name
11 for it.

12 THE COMMISSIONER: It's just
13 a line on the map.

14 A Fine, very good.

15 MR. MARSHALL: How about Barry 1
16 and Barry 2.

17 MR. GOUDGE: It's a string
18 on a field, I think sir. If you could keep those four
19 routes in mind, Mr. Williams, let me ask you to see
20 if you could perform this task of rating them from the
21 point of view of engineering difficulty, excluding the
22 factor of length. Excluding the comparison of length,
23 which, I as a layman can make without your assistance,
24 could you rate those routes in terms of engineering
25 difficulty.

26 MR. MARSHALL: Well, I think
27 Mr. Goudge, that you can't do that.

28 MR. GOUDGE: Well perhaps the
29 witness can tell me if he can. I can't do it and you
30 can't either.

Cooper, Hollingshead, Williams,
Winning, Clark, Purcell
Cross-Exam by Goudge

1 MR. MARSHALL: You'll be out
2 first Mr. Goudge, but it seems to me that the length
3 of line that has to be installed by a spread is an
4 engineering consideration, and that's inherent to
5 an engineering consideration of the four proposals.
6 You have to decide what the magnitude of the task
7 is, how many miles of pipe you have to put in. You
8 can't divorce the question of length of line. From an
9 engineering consideration of the relevant merits and
10 demerits of the four proposals.

11 MR. HOLLINGWORTH: Mr.
12 Commissioner, surely you can divorce the length from
13 assessing the difficulty in building the various
14 routes that are suggested.

15 MR. GOUDGE: Give it a try,
16 Mr. Williams.

17 THE COMMISSIONER: Excuse
18 me, Mr. Williams, before you do, Mr. Marshall objected,
19 Mr. Hollingworth dismissed his objection.

20 (LAUGHTER)

21 MR. GOUDGE: I was satisfied
22 with the results.

23 THE COMMISSIONER: As I
24 understand the objection it is that it is really
25 impossible to segregate ^{the} purely engineering considerations
26 and rate these routes on such a footing. Was that the
27 point?

28 MR. MARSHALL: Well, he wanted
29 an engineering rating of the four routes, but to
30 ignore the question of length of the routes. And I

Cooper, Hollingshead, Williams,
Hanning, Clark, Purcell
Cross-Exam by Goudge

1 said, well that --

2 THE COMMISSIONER: Which is
3 financial.

4 MR. MARSHALL: Well I say that
5 has vital engineering implications. It gets to the
6 question of how many spreads you're going to have to
7 have to do them, and the length of assignment for each
8 spread, and that gets to the question of productivity
9 that can be achieved, and there are a number of factors.

10 THE COMMISSIONER: Well, let
11 me put it this way. Leaving financial considerations
12 aside, which is easiest to build from an engineering
13 point of view, if that's the question that --

14 MR. MARSHALL: I think that's
15 a fair question, and it makes much more sense than
16 the one that was suggested previously.

17
18
19
20
21
22
23
24
25
26
27
28
29

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

1
2 WITNESS WILLIAMS: The main
3 difficulty that I see in the analysis is to try to
4 weigh a Mackenzie River crossing at Point Separation
5 plus a Peel River crossing, against Shallow Bay,
6 Reindeer, Langley Channel crossing. That is a little
7 difficult. As Dr. Cooper pointed out yesterday, the
8 Point Separation crossing is very difficult. If that
9 were, if that aspect were ignored like length of route,
10 Mr. Goudge, from a straight -- it is very difficult --
11 if you ignore the water crossings, the main route
12 across the delta is pretty easy going in my opinion.

13 As far as excavating the
14 trench and its' flat topography, it has quite a bit
15 going for it but if you throw in the water, the numerous
16 water crossings and it makes it substantially more
17 difficult.

18 Q And balanced against
19 that, I take it, is the very difficult Point Separation
20 crossing on the circum-delta route, and the almost
21 as difficult Peel River crossing on the same route?

22 A I would put the Peel a
23 fair bit farther down the scale than the Point Separation
24 crossing but it is still a difficult crossing. I don't
25 know -- maybe you could equate it to maybe the Langley
26 Channel crossing in terms of difficulty.

27 Q What do say to that, Dr.
28 Cooper?

29 WITNESS COOPER: A Well,
30 I think we are talking about difficulty from an

Cooper, Hollingshead, Williams:
Minning, Clark, Purcell
Cross-Exam by Goudge

1 engineering viewpoint and I think maybe you should
2 separate this into difficulty from an engineering
3 design viewpoint and difficulty from a construction
4 viewpoint. When we talk about engineering design, and
5 compare say the Point Separation crossing and the
6 crossings within the delta, on one hand, we are looking
7 at one set of problems. On another hand, on the other
8 route, we are looking at a different set of problems.

9
10 In both cases we can come
11 up with a safe design and one may require more
12 studies, more field data, but the end result is the same.
13 Once you achieve these designs then you have got the
14 engineering construction problems and I can't answer to
15 those but I am sure that you know the construction may
16 be more expensive for one crossing than in another.

17 Q Well, you focused, Dr.
18 Cooper, on river crossings as probably the major
19 criteria in the comparison between the four routes that
20 I recited and Mr. Williams, you did as well, dealing only
21 with engineering design which was the first subcategory
22 you spoke of. How do you choose, which do you rank as
23 more difficult in terms of coming up with the design --
24 the circum-delta route or the routes across the delta?

25 A I can't make that ranking
26 because I'm confident that we can come up with a safe
27 design for any of them.

28 Q I understood you to say that
29 one of the options might require more research and field
30 work and would therefore presumably be that much more

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

1 difficult than the other? Which one were you referring
2 to?

3 A No, sir. I was referring
4 there to Point Separation. Now, much of that work has
5 been done.

6 Q I see.

7 A But three years ago, when
8 the routing was there we recognized that there was
9 a potential for an ice jam related scour problem and
10 the means to design for such a problem were not available
11 at that time.

12 Q So in terms of engineering
13 design, you can't really choose between the routes
14 because although initially the design for the Point
15 Separation, Peel River crossing might have been more
16 difficult, you are far enough along that the scales
17 are relatively equally balanced now.

18 A That is right. That is
19 right. Now, there may be a difference in the number
20 of engineering hours required to design one route as
21 opposed to the other but I am certainly not prepared to
22 give you an estimate on that at this time.

23 Q Dr. Clark, I wonder if
24 you would have any other major criteria of engineering
25 difficulty to apply to the ranking that I asked for
26 besides river crossings?

27 WITNESS CLARK: A The
28 cross-delta route has more unfrozen soil so one would
29 have to say that the potential for frost heave is
30 greater there, on the same basis because there is more

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

1 unfrozen soil the potential for liquefaction is
2 greater there.

3
4 Both of these have been
5 investigated to an intensity probably greater than
6 anywhere else on the route and the results are fairly
7 comforting. Particularly in liquefaction--- the problem
8 we feel we have almost set behind us but we want some
9 more testing before we do.

10 The frost heave tests
11 that we have done show a comparatively low shut-off
12 pressure compared to what we find in many soils in the
13 discontinuous zones so that we don't see the frost heave
14 problem as being great in that area but there is more
15 unfrozen soil.

16 Q Yes, so we now have as I
17 understand it, three criteria of engineering comparison
18 -- river crossings, potential for frost heave, potential
19 for liquefaction. Is that fair?

20 A Yes, that is not an
21 all inclusive list. Those are three we have
22 talked about --

23 Q Are those the three major
24 ones?

25 A The potential for scour
26 was the initial consideration.

27 Q What about slope stability?
28 Is that an important criterion to apply?

29 A Yes, it is an important
30 criteria.

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

Q Have I got a fairly
complete catalogue now?

A I would add drainage
and erosion control and a consideration in the early
stages of the -- in selecting our depth across Shallow
Bay was the -- what we thought might be a potential
to ice raft the pipe out of the ground. In other words,
if the frost bulb couples with the frozen ground in the
shallow water and if the entire ice sheet were to rise,
we looked at the possibility of it lifting the pipe, so
that was a consideration there that didn't occur
in the other crossings.

Q But you have dismissed
it as something that won't happen, I take it?

A The analysis that we
have done indicate that it won't happen.

Q Yes, so that is really
not a criterion?

A Not now, no.

Q Now, Mr. Williams, coming
back to you, is it fair to say that you focused on
the river crossing comparison as the major one?

WITNESS WILLIAMS: A Mr.
Goudge, it seems to me that in doing an engineering
analysis all these factors are taken into account, and
the only meaningful end point that you reach is how
much does it cost and this has been done with respect
to the cross-delta prime route and the circum-delta
route. All of these factors have been taken into
account and in order to prepare a cost estimate that

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

1 is the only reasonable common denominator that you
2 can end up with. Then, of course, that has to be
3 weighed against the environmental concerns.

4 Q Yes, sir. In making the
5 comparison in terms of the engineering criteria I have
6 been talking about, is it fair to say that the comparison
7 really breaks down to one between the circum-delta route
8 and some cross-delta alternative, because there is not
9 that much distinction in engineering terms between any
10 of the cross-delta routes I have referred to?

11 A If you ignore length, I
12 think that is reasonable.

13 Q The length difference is
14 not nearly as substantial as between the three cross-
15 delta alternatives I speak of and the circum-delta?

16 A That is right.
17
18
19
20
21
22
23
24
25
26
27
28
29
30

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Goudge

1 MR. GOUDGE: I notice it's
2 almost 11:00. Are you proposing to break?

3 THE COMMISSIONER: O.K.

4 (PROCEEDINGS ADJOURNED)

5 (PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

6 MR. GOUDGE: If I can commence
7 again --

8 THE COMMISSIONER: Yes, before
9 you do, let me ask a couple of questions. Dr. Clark,
10 going back to frost heave and related issues -- this
11 has nothing to do with the delta, but it's a question
12 that I wanted cleared up. On rereading your evidence
13 and the evidence of other people, something came up
14 that I think I missed. Is it true that even if you
15 had no problem with permafrost, if there were no perma-
16 frost anywhere north of 60, given the volumes you want
17 to transmit through your 48 inch line and the pressure
18 at which you're transmitting the gas, that you'd have
19 to chill it anyway. That seemed to arise from something
20 that you and your colleagues said and I want to make
21 sure I understood you.

22 WITNESS CLARK: Maybe Mr.
23 Purcell would be best to answer to that. My understand-
24 ing was that, for instance, with the last point of
25 chilled flow that we have now, that the decision is
26 primarily a geotechnical one, that it wouldn't really
27 affect throughput as to whether we move north or south
28 of where we are, significantly. But, insofar as the
29 overall system is concerned, maybe Mr. Purcell could
30 comment on that.

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Goudge

1 WITNESS PURCELL: The pipeline
2 of this size and carrying the volumes of gas that it
3 does, has to be treated a little bit specially. It
4 doesn't necessarily have to be chilled as we propose
5 to do north of the 60th parallel, but some heat has to
6 be taken out of the gas. If it's not, the temperatures
7 just keep rising until they get out of sight.

8 Q Yes.

9 A So, south of the 60th
10 parallel, we are proposing to take heat out of the gas
11 at the compressor stations, but we do it by passing
12 the gas through heat exchangers and blowing air through
13 with fans. So that's a satisfactory technique, if
14 there's no concern with permafrost. But, you're right,
15 there does have to be some means of cooling the gas for
16 the flows that we're trying to accomplish.

17 Q O.K.

18 A In the absence of cooling,
19 the flow would be -- the maximum flow you could put
20 through the pipe would be less than 3 billion feet a
21 day. So, it would be cut back to something just
22 greater than half the capacity with cooling.

23 Q Right. One question
24 while you've got the microphone there. Yesterday or
25 the day before, you told us about -- you told us that
26 Arctic Gas was reconsidering the use of intermediate
27 block valves. You said that that wasn't a matter of
28 any great importance. I probably misunderstood you,
29 but the decision to install intermediate block valves
30 was designed, among other things I take it, to limit

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Goudge

1 the loss of gas from a rupture between compressor
2 stations. I take it that was one of the reasons at
3 least. In any event, why did you say that it -- maybe
4 you could deal with that first and then tell me why
5 you said it wasn't a matter of any great importance.

6 A I don't think that you
7 would put in valves simply to limit the amount of gas
8 that you lost because of a rupture. The valves cost over
9 a hundred thousand dollars and the chances of a
10 rupture are so low, that the potential savings is very
11 small compared to the cost of the valves all the way
12 down the pipeline. I was maybe being a little bit
13 superficial in saying that it wasn't an important
14 decision. I was thinking more in terms, I suppose, of
15 the cost of the project that for all practical purposes
16 wouldn't be affected by whether or not there were valves.
17 Although, of course, it would be a cost but it's
18 certainly not essential to the feasibility of the
19 project or to the cost of transporting the gas. It's
20 not an important decision in that light.

21 Q Yes. Well, what's the
22 principle reason for the intermediate block valves?
23 To have greater control of the flow of gas?

24 A No sir, they are something
25 that are traditionally put in pipelines at the time
26 of the -- at the time designs were worked up for this
27 application, they were required by the National -- by
28 the Canadian Standards Association Code. It required
29 block valves at approximately 20 mile intervals, so
30 we proposed to put one between each pair of compressor

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Goudge

1 stations. I think that more modern design now is
2 getting away from them because they are not really
3 very useful for normal operating circumstances and they --

4 Q That's why I -- every
5 time I think of a reason why you've got them there,
6 you tell me it doesn't apply. Carry on. Don't let
7 me interrupt you.

8 A Sir, the code now is
9 silent on the use of block valves and the option is
10 open to Arctic Gas to remove them from the plan. All
11 I was saying to Mr. Gibbs was that the decision hasn't
12 been made and I personally don't feel that it has to
13 be made today.

14 Q Yes.

15 A If you feel strongly
16 about it, well we could, I think, look at it and
17 advise you.

18 Q No, I don't feel strongly
19 about it. I just wanted to know why you said it wasn't
20 important because earlier on in these proceedings,
21 it seemed to me they had been regarded as something
22 that was an integral part of the whole scheme and so
23 when it was felt that they could be forgotten without
24 anyone missing them, I just wanted to know why.

25 A It happened to be one
26 of the few differences between the Foothills and the
27 Arctic Gas scheme and it might have been discussed a
28 little bit out of proportion to it's importance for
29 that reason.

30 THE COMMISSIONER:

All right. O.K. Well,

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Goudge

1 thank you.

2 A Yes sir.

3 MR. GOUDGE: Mr. Purcell,
4 before you put the microphone back, what is the cost
5 saving? What would it be by removing the intermediate
6 block valves from the system?

7 A It would be something
8 less than \$10 million I believe.

9 Q Just less. It is in
10 that area, is it?

11 A Yes, something like that.
12 I don't have an exact number.

13 Q Now, let me return to
14 where I was before the break. Dr. Hollingshead, you
15 said yesterday in answer to the Commissioner that
16 Point Separation was a most difficult crossing and I
17 understood you to feel that trading it for the four
18 crossings of the cross-delta route was not a bad trade.
19 Is that a fair summation of your position?

20 WITNESS HOLLINGSHEAD: I don't
21 think I'd really like to get trapped into putting
22 numbers on the tradeoff. It probably is the single most
23 difficult crossing that we've looked in the system.
24 You've got to put the peel on top of that and so you're
25 two majors against maybe four majors -- so called majors
26 -- on the cross-delta, but they're not the same
27 magnitude of individual problem. So I don't that I
28 should have probably accepted the ratio so easily maybe.
29
30

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

Q I take it, Dr. Cooper,
you would agree that the Point Separation crossing is
the most difficult crossing that this project has had
to deal with?

WITNESS COOPER: A Yes,
I think put in those terms that this project has had
to deal with, it certainly is. However, I think at
the current state of our ability to deal with it, that
it can be dealt with, with the same level of confidence
as could any other crossing.

I think the difference
possibly in an assessment I might make of these matters
and an assessment Dr. Hollingshead might make is I am
not looking at the construction problems, I am looking
at the design problems.

Q The major focus of your
concern as the design at the crossing is the ice scour
problem?

A Yes, ice jam related scour
problems.

Q Mr. Hollingshead, the other
crossing that you tacked on top of the Point Separation
crossing was the Peel crossing, I take it while you feel
it is a difficult crossing, it is not of the same
order of magnitude perhaps as the Point Separation
crossing?

WITNESS HOLLINGSHEAD: A Well,
I don't think I described it as a difficult crossing.
I think we have called it a major crossing and that

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

1 really relates I guess more to the construction aspect
4 of construction costs rather than to the design.

3 Q Well, it was one of the
4 three or four crossings that you proposed on the
5 original application to twin?

6 A That is right, sir.

7 Q And I take that to indicate
8 that you felt it posed some risk at least to the project?

9 A There is always some risk.
10 Everywhere in the system the rationale for the twinning
11 at those major crossings was really a question of how long
12 the crossings might be out of service if you got a break
13 there and the duration at the Peel would be probably the
14 same order of weeks as at Point Separation. You have
15 a period of spring breakup in which it is very difficult
16 to do much work on a major river and if something happens
17 at that time of year, you would simply be out of service
18 for an extended period of time.

19 Q Mr. Williams, one of the
20 other things you discussed with Dr. Barry was the use
21 of DEW Line site locations and I understood from your
22 evidence in answer to Mr. Marshall that one of your
23 concerns with using DEW Line station locations was the
24 related problem of crossing the wide fans of the North
25 Slope rivers near the coast?

26 WITNESS WILLIAMS: A Yes,
27 and that would be based on shifting the route to
28 northerly, towards the coast, Mr. Goudge. Of course,
29 there^{is} the alternative of running laterals from the
30 present location to the sites and back again which

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

1 is very costly.

2 Q I was coming to that.
3 That is an alternative whose ^{only} constraint is cost.

4 A The hydraulic balance
5 would certainly be upset I am sure and Mr. Purcell
6 might be able to speak to that, Mr. Goudge. Dr. Barry
7 made the point that the compressor stations were
8 spaced at about 50 miles and likewise the DEW Line sites
9 were at the about 50 mile spacing. I think he said that,
10 but I don't know if Mr. Purcell has looked at the
11 hydraulic problems but maybe he can say something.

12 Q Well, Mr. Purcell, let
13 me ask you initially from the hydraulic point of view
14 there is no difficulty about having a compressor station
15 off the main line, connected to the main line by a
16 lateral? That can be done?

17 WITNESS PURCELL: A It
18 can be done but it is certainly more costly.

19 Q Yes.

20 A The pressure drop
21 through the pipe is a function of its length.

22 Q Yes.

23 A It would add to the pressure
24 drop, add to the fuel consumption, add to the size of
25 the compressor stations.

26 Q Have you made any exami-
27 nation of in even general terms, the feasibility of
28 using Mr. Williams' suggestion to run laterals to
29 compressor stations located on DEW Line sites?

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

1
2 A No, sir, we have not
3 studied it.

4 Q Mr. Williams, dealing
5 with the other option that would be available with Dr.
6 Barry's suggestion, what is the engineering problem
7 associated with the crossing of the wide fans on the
8 North Slope rivers?

9 WITNESS WILLIAMS: A Well,
10 with the braided rivers, the potential is always there
11 that the channels can move so the way that that would
12 have to be overcome would be either have deep burial
13 across the full width of the fan or install training
14 structures. That is the major problem.

15 The other is the actual
16 construction across the fan, just the physical width
17 and the unevenness of the topography because of the
18 braids then makes construction a little more difficult
19 on a per mile basis.

20 Q In some cases though, for
21 example with the Malcolm River, you are planning to
22 cross part of the fan with your route as proposed?

23 A That is correct, the alter-
24 native there, Mr. Goudge, is to go farther south and
25 then you get into some very rough topography. You get
26 into the foothills of the Richardson Mountains and in
27 that case we weighed those two considerations and
28 decided that crossing the shorter section of the fan
29 was more advantageous than going into the foothills of
30 the Richardsons.

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

Q Yes, but there is nothing about crossing that kind of fan that creates an absolute impediment. It simply creates the problem of the moving channel that you spoke of.

A That is correct.

Q Mr. Williams, let me come to Shallow Bay in particular and deal first with the problem that Miss Lane addressed to you, that of the erosion at the west side of Shallow Bay. Your material, I think, says that the erosion at the west side of Shallow Bay where you propose to have your pipe coming up out of Shallow Bay is in the area of 500 feet over 20 years. Perhaps, Dr. Hollingshead, you can address yourself to that.

WITNESS HOLLINGSHEAD: A Yes I think it is probably quoted correctly.

Q Yes and wouldn't you agree that that order of magnitude probably surpasses the erosion anywhere else on the north coast from Alaska through the end of the Tuk Peninsula?

A I don't know that I could say that. I haven't studied the north coast from Tuktoyaktuk to --

Q Dr. Cooper, can you comment on the proposition I put?

WITNESS COOPER: A No, I haven't studied it. I have read Dr. Lewis's testimony but I can't recall what he stated on that.

Q Well, his advice to us is

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

that it is of that order of magnitude but if you can't comment, I can't ask you any more about that. Let me ask you though, Dr. Hollingshead, you said this morning that you felt that that erosion had taken place -- I think you said in the order of 25 to 30 feet a year. Is that correct?

WITNESS HOLLINGSHEAD: A

We have had a look at the earlier topography which we did not have available at the time that report was written, and if you look at it over a greater span of time the annual average is somewhat greater than what we quoted in that report and it is probably in the order of 30 feet, which if you want to put some other interpretation on it, it may be receding at a lower rate in more recent times. It was probably going faster than that between 1930 and 1945.

Q Do you know whether the erosion has taken place on a regular basis or has it occurred in big chunks?

A Well, I suspect a lot of it is a result of the number of lakes which are in the vicinity of the shoreline there and certainly when the coast line, shoreline recedes and intercepts a couple of ponds or lake bodies then you are left with a sort of a peninsula and that is going to erode rather rapidly, so from, in that sense, it is somewhat irregular. You could go through a period of years, I suppose when it would be relatively minimal and then you are going to break through a spot and maybe it broke through a couple

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

1 of former lakes and the rate would increase for a
2 period of time.

3
4 On the other hand, there
5 is not as I understand it, there is not massive
6 ground ice in there and so the other mechanism if you
7 like the straight thermal niching of the coast line,
8 forgetting about the presence of the ponds and lakes,
9 would probably tend to be a relatively uniform rate
10 over the years, subject presumably to the same wave
11 action from year to year and essentially the same
12 ground ice conditions.

13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29

Cooper, Hollingshead, Williams,
Harris, Clark, Howell.
Cross-Exam by Goudge

Q But you can't really tell whether the 500 feet that has occurred, occurred really on the basis of wave action erosion which would imply a regular rate of erosion or due to storm surges which might imply an irregular rate.

A I don't think the storm surges would -- I wouldn't rank that as one of the higher possibilities. I think the two I mentioned are more likely. I think that the 500 feet has in the last years 20 twenty odd has probably been more a function of the wave action.

Q Now, there's -- sorry. Had you finished sir?

A Yes, I think so.

Q There's no doubt that this presents a problem to you in the sense that if the pipeline has a life of 20 years, you may be faced with another 500 feet of erosion and unless the pipe is either set back or the erosion is controlled, the pipe will be exposed.

A Well, I'd have to agree and disagree. I'd agree with the latter part of your statement and I disagree that it's a problem.

Q O.K.

A It's no -- we do not see it as a problem. Certainly, the sag bend in the pipe is either going to have to be set back a sufficient distance to accomodate that bank retreat or channel training works will be to be implemented.

Q Yes, and as between those,

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Goudge

Q We've chosen the erosion control mechanism rather than the setback mechanism.

A I believe those words are in the preliminary ~~report~~ that that is -- the problem is stated there and that is pointed out as one possibility. Obviously, the design is incomplete in that sense, at this stage. My feeling right now is that it may well be cheaper to set back the sag point an adequate distance. That is, something in the order of 1,000 or 12,000 feet. That may well be cheaper in the final analysis than instituting bank protective measures.

Q It would also be more reliable, wouldn't it? Once you get the pipe back a thousand or 1200 feet, given the last 20 years of experience, you've got 50 years protection.

A That's right on the basis of the rates that we've estimated from the photography, certainly you'd be several decades before you'd have much concern.

Q There may well be problems with going the other route. that is, the bank protection route in this sense; that bank protection at the point where the pipe comes out of Shallow Bay may leave a promontory when erosion takes place beside the protected area?

A I'm not sure what you mean by a "promontory" but I don't think that that's necessarily so, no.

Q Let me ask you this.
Do you have a general idea of the length of shoreline

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Goudge

1 over which this 500 feet of erosion took place? Was it
2 over a large length, or was it just over the narrow
3 area where your pipe comes out?

4 A We're talking about some-
5 thing in the order of a mile; five, six, seven
6 thousand feet.

7 Q Yes. So that if, unless
8 you propose to protect that entire strip, if you decide
9 to go the erosion control route, you're going to have
10 a narrow protected area within that mile with the rest
11 of the mile continuing to erode.

12 A Well, I can assure you,
13 I don't think that our designs would lead us to simply
14 protecting the 2 or three hundred ^{feet} that the pipelines
15 are occupying and that would not be the answer,
16 certainly.

17 Q So if you go--

18 A If we were -- If we
19 were seriously thinking of adopting that approach, we
20 would be looking at that entire chunk of the coast-
21 line which is probably in the order of seven thousand
22 feet.

23 Q So the options are on the
24 one hand a set back of 1200 feet in the sag bend and
25 on the other hand, bank protection covering the full
26 seven thousand feet of rapidly eroding shore?

27 A Yes sir, I think those are
28 the options that I see right now.

29 Q And your choice to
30 recommend to your client is the setback technique?

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Goudge

1 A Without the benefit
2 of having any -- done any detailed calculations or
3 talking to the costing people, my guess is, right now,
4 it would be cheaper to setback the sag bends in the
5 order of a thousand feet from the shoreline.

6 Q Dr. Cooper, do you have
7 any comment on those two techniques or is that side
8 out -- is that outside your area of attention?
9

10 WITNESS COOPER: It is a bit
11 outside my area of expertise, so I have no comments.

12 Q Dealing with the --
13 one more aspect of it, Dr. Hollingshead, what -- have
14 you given any thought to the type of erosion control
15 device that -- device that might be used over the seven
16 thousand foot strip that you'd be protecting?

17 WITNESS HOLLINGSHEAD: Well,
18 I think one possibility certainly would be a gabion
19 type structure.

20 MR. HOLLINGWORTH: Sorry,
21 what did you say, sir?

22 A Well, it's called a
23 gabion revetment, if you like. G-A-B-I-O-N. That's
24 a system of linked packages, if you like, in which you
25 -- which you fill with gravel size material -- gravel
26 and cobble size material and then place along the
27 shoreline as a revetment. Dr. Clark has had some
28 experience, I think, in these sort of revetments. He
29 may have some other possibilities, but that would be
30 one, certainly.

Q Dr. Clark, can you suggest

Cooper, Hollingshead, Williams,
Manning, Clark, Purcell,
Cross-Exam by Goudge

any other type of erosion control device that you
have considered for this?

WITNESS CLARK: Well, the
gabion is a pretty obvious one in that there would
be quite a bit of gravel there at the work pad. Another
alternative is riprap which would probably be quarried
and it would have to be designed to resist the wave
action. We haven't looked at the sizing that might
be required. So, it would be an economic analysis
to determine whether it's better to use gabions or
better to use a dumped riprap.

Q Yes. Would you agree
with Dr. Hollingshead that the preferable technique
is the setback technique?

MR. MARSHALL: Well, he hasn't
said that. He said that's just a guess. He hasn't
worked out the figures. There's a lot of calculations
would go into it, Mr. Goudge. I don't think they can
carry you beyond that.

MR. GOUDGE: Which do you
prefer, Dr. Clark?

A Well, another alternative
that I would certainly like to have a much more detailed
look at is the combination of the two systems. As
Dr. Hollingshead pointed out, it is eroding at a
decreasing rate. We could perhaps look at the feasibility
of a setback of around 5 or 600 feet monitoring over
the next ten or 15 years and then, if necessary, put
in the erosion control or bank protection measures and
that may prove to be the more economical one.

1 Q I take it in connection
2 with your use of borrow materials, there has been no
3 inclusion in your estimates of the need for 7,000 feet
4 of coastline protection.

5 A The work pad is there and
6 there's a great deal of borrow material there. We
7 haven't balanced the two, so I'm not -- I can't say for
8 certain if there's enough in the work pad that could
9 be spread to provide the protection.

10 Q Would that mostly be
11 too fine a material to use for erosion control?

12 A If it were gravel, it
13 would be suitable if it were put in the gabion
14 baskets.

15 Q I see. Beyond though,
16 the material required for the work pad at that site
17 you've made no additional allowance in your borrow
18 material numbers for bank protection there?

19 A No, we haven't Mr. Goudge.

20 Q Mr. Hollingshead, let
21 me deal with one second aspect of Shallow Bay and
22 that is the nature of the bed on Shallow Bay. Dr.
23 Lewis, when he gave evidence before the Inquiry in
24 Inuvik, if I can paraphrase him accurately, I think
25 gave us to understand that the bed under Shallow Bay
26 is a very mobile bed. Would you agree with that
27 description?

28

29

30

Cooper, Hollingshead, Williams,
Minning, Clark, Prucell
Cross-Exam by Goudge

1 MR. MARSHALL: I'm sorry, you've
2 lost me, Mr. Goudge. Do you have reference in the
3 transcript, or something, so that I could attempt to
4 follow this? I thought Mobile Bay was in the Gulf
5 of Mexico?

6 MR. GOUDGE: Page 19047 of
7 the transcript, Dr. Lewis said this,

8 "There's a tremendous amount of sediment being
9 brought into Shallow Bay from the channels of
10 the Mackenzie River, and that a considerable
11 portion of this sediment will be deposited in
12 either permanently, or mostly temporarily in
13 Shallow Bay."

14 So, we have a lot of sediment coming in, we have a lot
15 of sediment being dropped in Shallow Bay, perhaps to
16 be moved again at some stage, but still, we'll have a
17 changing bottom, one that will be having sediment
18 deposited, and then picked and eroded and moving through.
19 I think the bottom would be -- and then he goes on and
20 says at the end of that passage,

21 "I think the bottom would be too mobile for scour."
22 And I paraphrased that, Mr. Marshall.

23 MR. MARSHALL: I'm with you
24 now. Thank you, Mr. Goudge.

25 MR. GOUDGE: It was said that
26 a moving bed is a Winnebago, and I can't resist putting
27 that on the record, but leaving that aside aside, Dr.
28 Hollingshead, do you agree with Dr. Lewis that the bed
29 of Shallow Bay is mobile?

30 WITNESS HOLLINGSHEAD: When you

Cooper, Hollinghead, Williams,
Minning, Clark, Purcell
Cross-Exam by Goudge

1 say "mobile", yes I would agree with that. I have
2 trouble with the word "very".

3 Q Yes. Have you done
4 any research as to the extent of this mobility, the
5 degree of change that there may be on the bed at the
6 point you cross?

7 A Not beyond the -- we
8 have not done anything specifically, beyond the
9 soundings which we've taken over a couple of years, at
10 different times over a couple of years period; but I
11 guess that's the -- that, plus of course some sampling
12 in Shallow Bay, which of course is an indication of
13 the size, material size. Dr. Cooper may have some
14 better feeling for the mobility, or the magnitude of
15 the problem.

16 Q () Dr. Cooper?
17 WITNESS COOPER

18 A I've kind of lost track
19 of your question.

20 Q I'm addressing myself
21 to the mobility that is said to exist on the bed in
22 Shallow Bay, and I'm asking whether you are aware of
23 any research that speaks to the extent of the problem.

24 A There's been no work done,
25 measuring transport rates on the bed, or, for that
26 matter in Shallow Bay, of suspended transport rates,
27 no, not to my knowledge.

28 Q Well, let me come to
29 the Kenting study, which has been tendered as an exhibit
30 previously and which was prepared, I think, for Northern
Engineering, and which I think you gentlemen are

Cooper, Hollingshead, Williams,
Manning, Clark, Purcell
Cross-Exam by Goudge

1 familiar with, are you not?

2 A Yes, I've seen the results
3 of that.

4 Q There was an echo sounding
5 device used to take a profile of the bed of Shallow Bay
6 at the point where the pipeline is proposed to cross,
7 is that so?

8 A That's correct.

9 Q And my layman's view
10 of that is that it shows a large number of depressions
11 on the bottom.

12 A It shows a somewhat
13 irregular bottom, yes.

14 Q Depressions that may be
15 of the magnitude of five or six feet.

16 A I think I'd better get
17 the chart, I'm sorry.

18 Q I think I probably have
19 the only copy.

20 A We have one here. You're
21 referring --

22 Q I'm looking at the A-B
23 line, sir.

24 A Yes.

25 Q And would you agree that
26 it indicates that there are depressions, or trenches
27 in the bed, that are relatively numerous, when you
28 speak of the five to six foot range, that is, a trench
29 or hole five to six feet below the bottom.

30 A I would not like to refer

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Goudge

1 to them as trenches. If you look at -- if you were to
2 take the water out of there so that you could walk
3 on the bed, you would see a very irregular bed, there's
4 no question about that, because as material moves
5 along the bed, it would form into forms that we refer
6 to as dunes, that could be four, five, six feet high.
7 Plus some of the irregularity on that could be due
8 to the boat movement --

9 Q I'm sorry?

10 A -- the boat movement
11 when they were taking the soundings. On that day it
12 was very rough, so that is going to complicate the
13 picture somewhat, but yes, I'm willing to accept that
14 you're going to have a very irregular bed.

15 Q And that bed is reflective
16 of the mobility of the sediment in the bay?

17 A Yes sir.

18 Q And the mobility -- the
19 sediment is moved as a result of the flows through
20 Shallow Bay?

21 A That's correct.

22 Q So that if I can
23 categorize it, it would be in some sense flow scour?

24 A No, we're not talking
25 about scour here, we're talking about material being
26 transported across the bed surface. If I can, say,
27 refer to this table as an average bed, now you've got
28 material that's being transported into this end of
29 the table, the flow across the table; material being
30 transported off the other end. Unless the material

1 coming in this side, the rate at which it comes in
2 is considerably less than the rate it's going off the
3 other side, then you don't have any scour, you just
4 have a continuous movement of material.

5 Q I see. Well let me ask
6 you this. The study we are looking at, the Kenting
7 study, was done in September. Is that so?

8 A That's correct.

9 Q Do you have any doubt
10 that if you did a similar sounding the following June,
11 say, you would get a profile that placed the depressions
12 or trenches at different points along the bay?

13 A That could well happen.
14 Yes, the topography would be different, the average
15 bed level at that location would in all probability
16 be the same.

17 Q I see. As a layman, then,
18 I might think that if you chose to put your pipe ten
19 feet below the bed in Shallow Bay, the creation of
20 a four or five foot trench above that, due to changing
21 flow, might reduce the cover over your pipe to five
22 or six feet.

23 A Well, we're talking about
24 ten feet below the lowest point in there. We're talking
25 about ten feet of cover below -- within that portion,
26 below the twenty foot level. We certainly couldn't put
27 the bends into the pipe, to follow that very irregular
28 contour, plus we also recognize that the bed is
29 irregular, and it changes, and we wouldn't want to do
30 that for fear of engineering reasons.

Coppel, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Goudge

1 Q Now one other thing that
2 interested me about the Kenting profile was the very
3 deep hole that's shown on the DE line, very close
4 to your proposed crossing.

5 A I think it's approximately
6 what -- 2,000 -- 1,500 to 2,000 feet downstream?

7 Q I haven't done the
8 measurements. It looks close. What do you attribute
9 that hole to?

10 A There could be I would
11 say one of two causes for it. As Lewis pointed out
12 in his testimony, the holes within the other channels
13 of the delta are not uncommon. Normally we can
14 predict where they will occur. However, when you
15 get a channel migrating over top of some -- oh some
16 older deposits, some of which may be cohesive, and the
17 new channel wants to erode the average bed, in these
18 cohesive sediments, it can't do it. You've got something
19 like a sill across the channel. It can't go to the
20 depth it wants. Just downstream of that, it will --
21 downstream of this sill I'm talking about, it will
22 erode a scour hole. Now we found a number of instances
23 of this in other delta channels. That could be one
24 cause of this hole downstream. Another cause, one that
25 I feel is more likely, is we have a subchannel coming
26 down the west side of SHallow Bay. We also have the
27 flow coming out from Reindeer Channel, and you have
28 the mixing of these flows. Now, as I believe I discussed
29 in my earlier testimony before this Commission, when
30 you have a confluence of two flows from these so-called

Cooper, Bellin, 12-11-1961
Manning, Clark, Purcell
Cross-Exam by Goudge

1 subchannels, in the zone of mixing, you get a diving
2 current, and this current, although it's velocities
3 wouldn't be high in this case because of the approach
4 velocities, would be quite capable of scouring a hole
5 downstream of the confluence, and this hole would be
6 more or less a permanent feature. There wouldn't be
7 much transport moving through it, or much material
8 moving through it, it would move along the sides of it.

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

Q I see. Is your crossing
itself downstream of that confluence?

A Our crossing is upstream
of the location where I would suspect the hole would
form. However --

Q It is downstream of the
confluence, isn't it?

A Well, no not necessarily.
It is very close to the confluence and keep in mind
that the hole will form some distance downstream in
the mixing zone.

Q But isn't it true --

A But we don't know --

Q First, you don't know and
second --

A What are you referring to
as a confluence?

Q Well, I understood you to
suggest that this deep hole might well have been due
to the downward swirl caused by the confluence of the
Reindeer Channel and Shallow Bay.

A Yes, but are you referring
to the confluence as you would see it on the map?

Q Well, what I am referring --
Let me ask the question this way. How can you be certain
that the confluence which caused this hole only 200
or 2000 feet as you say downstream of your pipe crossing
will not cause a similar hole at the point you propose
to cross?

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

1 A Oh at this point in
2 time, we can't be, but as part of our final design work,
3 we will go out -- we will go out and map the bottom
4 topography. We have plans now to do that and determine
5 where these subchannels are, determine definitely that
6 this is in fact the cause and make a determination or
7 evaluate whether that hole can, in fact, migrate upstream.

8 Q Well, the two flows, the
9 confluence of which you suggest may have caused this
10 deep hole come together upstream of your proposed
11 crossing?

12 A No, sir, we have no
13 evidence to suggest that.

14 Q I see. Dr. Hollingshead,
15 you look like you are anxious to say something.

16 WITNESS HOLLINGSHEAD: A It
17 seems to me that the difficulty is that you are looking
18 at a confluence which appears on the map and is easy
19 to see and which is obviously upstream of the pipeline
20 crossings and Dr. Cooper is talking about a confluence
21 with two subchannels which you can't see which he suggests
22 may well be at a point some 2,000 feet downstream of
23 the crossing.

24 WITNESS COOPER: A Possibly
25 if I could illustrate this on the map, it would help.

26 Q Please do. It would.
27 I'm all too taken by the big channels on the map.

28 A Well, we have our
29 soundings along the centre line of the proposed
30 crossing indicate the deeper subchannel in the

~~Cooper~~, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

portion right here on the west side. Now, at the same time we have the flow coming up from Reindeer Channel and it would form, in all likelihood a subchannel that would meet the deeper subchannel in Shallow Bay.

Now, on the basis of the information we have right now that the bottom topography, we don't know exactly where that confluence is.

Q It looks suspiciously like where your finger is.

A Well no, the hole that has been observed in the Kenting work last year is some 2,000 feet downstream. Now, if that indicates the confluence, we know that a hole from a confluence will develop just downstream of a confluence, so we are pretty close to it at the crossings but we don't -- we see no reason just on the basis of that evidence to think that we are too close to where the hole is.

Q Well, let me put this hypothetically to you. If you should discover that the hole is due to the confluence, wouldn't you feel uncomfortably close to it at your present location?

A Once we got the detailed survey information, that would be a possibility, like once we map out where these subchannels come in, one possibility is yes, we could feel we are too close to it. We would then have to, as part of the final design modify this preliminary design and there are several ways in which we could do this.

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

Q One of them being to
move upstream I take it?

A One of them would be to
move the present crossing something in the order of
1 to 2,000 feet upstream. That would probably get us
out of any danger area, if in fact we are in one.

Another would be to
deepen the crossing such that we would accommodate
such scour for a length of maybe 2,000 feet at its
present location.

Q Given the depth of this
scour hole that shows, I think, a depth of roughly
30 feet below the bed, you have got a very deep
trench if you take that solution?

A Not really, I think if we
can refer the depths for this discussion as measured from
water surface, we have got a hole that is probably
45 feet deep. Now, we don't have enough information
to begin with right now to say, to predict exactly how
deep we would have to design for, but let's for the sake
of discussion assume that we might have to go to a depth
for the top of pipe of something in the order of 50
feet.

Keep in mind that at the
present location, we are excavating from approximately
the 20 foot level. Correct. This would mean that we
would have to excavate a trench of something in the order
of 30, 35 feet which compared to the rest of Shallow
Bay is not that much deeper.

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

1
2 We have made some rough
3 calculations and we feel that it would add about
4 something in the order of 10% to the total volume for
5 each crossing of excavated material.

6 Q One sure way, I take it,
7 to avoid this confluence would be to move upstream as
8 far as the Barry Crossing.

9 A Not necessarily and I don't
10 see any engineering reason at this time to avoid it.

11 Q Well, is it -- sorry,
12 Dr. Hollingshead, do you want to comment on that?

13 WITNESS HOLLINGSHEAD: A I
14 was just going to say that I don't think we have
15 established that despite all this discussion, I don't
16 think we have established that there is such a confluence
17 there.

18 Q Well, Dr. Cooper gave
19 it as the more likely of the two explanations he could
20 offer.

21 WITNESS COOPER: A I said
22 there were two possible causes and in my view it is
23 possibly somewhat more likely. It could be either one
24 though.

25 Q Is it true, Dr. Cooper,
26 that these confluences occur at very frequent intervals
27 right up the length of Shallow Bay because of inflows
28 into Shallow Bay?

29 A We are dealing with much
30 smaller channels there and I don't think any of the other
31

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

1 situations would create serious scour problems and for
2 that matter we don't have a serious scour problem at the
3 location we are at now. We have to keep in mind that
4 whenever we cross a braided river, for example, we're
5 designing on the basis of scour due to a confluence.
6

7 Q Well, let me go back to
8 your first cause for this hole and that was the, I take
9 it, your proposition that there might be a solid --
10 I have forgotten the words you used --

11 A Resistant .

12 Q Resistant substance
13 in the bottom of the bay which forced a hole to appear
14 beyond it.

15 A Yes, basically that is
16 correct.

17 Q Very layman language and
18 I apologize.

19 A It could be -- possibly
20 I can give a somewhat more detailed explanation that
21 historically as Shallow Bay filled in, you could have
22 had a historical channel in there. Now you have had a
23 shift in that channel and the current channel is running
24 across at the upstream end of that hole a resistant
25 formation that is somewhat higher than the surrounding
26 bed.

27 This would cause a diving--
28 a bit of a diving current and would prevent the infilling
29 of the area downstream.

30 Q Well, let me ask you

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

whether you have given any consideration to this same kind of process resulting from a growing frost bulb around a chilled pipe under Shallow Bay.

A I think I understand your question for--

Q Let me make sure you do. The freezing of the soil around the chilled pipe will create a resistant substance. You would agree with me there? And that may well, if the frost bulb rises close to the surface of Shallow Bay, create a resistant substance across Shallow Bay higher than the surrounding bed?

A Not, certainly not higher than the surrounding bed.

Q Well, is it something that will cause you concern insofar as possible resulting scour downstream of it is concerned?

A It causes a -- what I would call the opposite of concern. I consider the frost bulb around this pipe when we are doing the scour to be an additional factor for safety. As a matter of fact, on our work on the Alyeska project, we were engaged to do some laboratory tests to determine what would happen when the bed eroded down and exposed the pipe. We found that the four-foot diameter pipe by itself was quite a safety factor in that the general bed could erode down to the bottom of the pipe. You would get a ramp on the upstream side. You would get a ramp on the downstream side of sediment. Somewhat of a scour hole below that or

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

1 further downstream of that but you would not get a
2 blowout or expose your total exposure of the pipe.

3
4 Now, if you have a frost
5 bulb, this going to even increase this factor of safety.
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

Cooper, Hollingshead, Williams,
Pinning, Charles, Purcell,
Cross-Exam by Goudge

1 Q But you do get a scour
2 hole downstream of the pipe?

3 A Only sir if the general
4 bed wants to degrade to a level that would normally
5 expose that pipe. Now, in Shallow Bay, we know that
6 we are ^{generally} in a depositional area and we're not going to get
7 any long-term degradation.

8 Q Well does that apply
9 as well during the breakup period when the flows are
10 very rapid?

11 A Yes sir, as I explained
12 before, we can have -- and I should add, they're not
13 very rapid. We may get velocities of one to two feet
14 per second in that order as opposed to half a foot per
15 second. Compared to other channels we're dealing with,
16 this is very slow. However, in breakup period, your
17 transport rates could be somewhat higher. But again,
18 we're just moving material across the bed. We're not
19 scouring it.

20 Q So that you say because
21 it's a depositional area, you feel there will be no
22 scour downstream of any frost bulb.

23 A No sir, I don't. I would
24 not expect that scour downstream of any frost bulb
25 even if it was not a depositional area.

26 Q Yes. Well then, I take
27 it because it's a depositional area the first cause
28 you gave for the deep hole is an unlikely cause and
29 the more likely cause is the confluence theory.

30 A Not necessarily. You see,

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Goudge

1 we're dealing with very fine material -- very fine
2 sands and silts and you can get a local velocity
3 patterns -- flow velocity patterns -- that are just
4 somewhat higher than say the average velocity and you
5 will get sufficient current to prevent deposition
6 in certain areas. Now, the first cause would be a very
7 likely^{one} and it would sustain a hole in that one location.

8 Q Mr. Cooper, you spoke
9 of the need to conduct further studies to determine
10 the relation between the confluence problem you spoke
11 of and the location of your proposed crossing. Are
12 those studies in terrain, are they --

13 WITNESS HOLLINGSHEAD: Yes,
14 if I may comment on that, Mr. Goudge, all our plan
15 right now is to go out as soon as we can this year
16 after ice breakup and conduct a thorough study of the
17 Shallow Bay crossing area, both up and downstream of
18 the crossings and in effect, map as completely as
19 necessary the bed topography in Shallow Bay. At the
20 same^{time} of course, we will be again, looking at the other
21 channels.

22 Q Yes.

23 A But our intention is to
24 map as thoroughly as necessary the bed of Shallow Bay
25 in the vicinity of the crossings and if this second
26 subchannel -- we know of the one subchannel exists
27 if you like, which runs essentially parallel to Shallow
28 Bay at about this third point from the west side. We
29 know that exists. If this second subchannel appears,
30 then we will -- we will find it and we'll find the

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Goudge

1 confluence and we'll know where we stand. That work
2 should be ongoing in July of this year.

3 Q Now finally, before I
4 leave the Kenting report, on page three of that report,
5 the authors, in analyzing the profile that you've
6 been speaking to, Dr. Cooper say that they feel it's
7 anticipated, and I'm quoting here that:

8 "The change in bottom profile from smooth on the
9 banks to rough in the deeper water is due to ice
10 scouring."

11 I take it from your views expressed yesterday, you
12 don't agree.

13 WITNESS COOPER: No sir, I
14 don't. I think I indicated yesterday that we could
15 get some minor ice goudging, but no major ice scour
16 or erosional scour due to flow beneath the jam of any
17 sort.

18 Q Yes, and you don't feel,
19 I take it, that there's any prospect of scour due to
20 ice islands being pushed into Shallow Bay?

21 A I can't comment on the
22 possibility of that, but I think I would tend to agree
23 with Lewis and Shearer, I believe, that they didn't
24 think there was any possibility of that because of
25 the six foot depths on the outside of Shallow Bay.

26 Q Now, a third aspect of
27 the Shallow Bay crossing that has concerned me and
28 this is for you Dr. Clark, relates to the frost heave
29 problem which may exist under Shallow Bay. I take it
30 because the pipe is chilled and because it's going

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Goudge

1 through unfrozen soil and because there's a lot of
2 moisture around, that heave is a problem there?

3 WITNESS CLARK: It has a
4 potential of heave, yes sir.

5 Q Yes and you'd agree with
6 me, I take it, that unlike areas onland where heave
7 is a problem, you cannot add a berm after construction,
8 should you find heave developing.

9 A That's correct.

10 Q -- because you're under
11 water. So the premium on successful counteracting
12 of heave, the first time round, is greater under Shallow
13 Bay than it may be on land.

14 A That's correct.

15 Q Now, when you gave
16 evidence earlier, I think you were asked and I don't
17 have a reference for this and perhaps you'll correct
18 me if I'm wrong, but I think you were asked about this
19 and in response you said that there may be two counter-
20 acting mechanisms available for frost heave under
21 Shallow Bay. One was compaction during freezing.

22 A Yes. sir.

23 Q The second was the alterna-
24 ting of flow. That was a device that could have been
25 used to counteract heave.

26 A Yes, that's correct.

27 Q I take it -- well, let
28 me ask you, are you still of the view that with the
29 sediment types existing under Shallow Bay, there will be
30 compaction on freezing so as to counteract heave?

Cooper, Hollingshead, Williams,
Minning, ~~Clark~~, Purcell
Cross-Exam by Goudge

1 A No. The compaction --
2 there will be some compaction on freezing, but much
3 less than we had envisaged at that time. Since then,
4 we now have test data on the consolidation properties
5 of the material and it is denser than what we thought
6 at that time.

7 Q Yes, and I take it from
8 what you said yesterday that you now do not intend to
9 use the alternating flow mechanism to counter heave?

10 A That technique -- we
11 never had really intend that either there or any of
12 the dual crossings as a prime method. It was always
13 thought that this was something that was available
14 should it prove necessary. It still would be available
15 here for about the first five years of operation.

16 Q But you don't really
17 consider it in your active arsenal of antiheave weapons?

18 A No, we consider here
19 that our initial burial depth must be sufficient to
20 provide sufficient over burden pressure to keep the
21 frost heave within tolerable limits.

22

23

24

25

26

27

28

29

30

1 Q I take it as well you
2 may get some marginal assistance from the concrete
3 jacket around the pipe, in counter-acting heat?

4 A It adds a little bit of
5 weight, but after the frost bulb has developed a bit,
6 it kind of overwhelms the pipe.

7 Q In relation to the
8 development of the frost bulb, your holes -- your
9 exploratory holes indicate a permafrost bed I think
10 at around the thirty foot level. Is that so?

11 A That's right sir.

12 Q Just out of curiosity,
13 would you anticipate the frost bulb advancing to freeze
14 to the permafrost bed?

15 A Yes sir.

16 Q And I take it at that
17 point you've got it locked in about as solid as you
18 can get it.

19 A I would think so. We're
20 not sure of the configuration of that permafrost bed,
21 but its presence there is comforting.

22 Q Now a related subject
23 Dr. Hollingshead was one that you touched on in relation
24 to Dr. Lewis's testimony. He referred to another kind
25 of compaction -- compaction due to the melting out of
26 permafrost, and resulting settlement. I take it you
27 have some doubts about that theory. Is that so?

28 WITNESS HOLLINGSHEAD: I don't
29 think it's so much doubts about the theory. I think
30 first of all the testimony was rather confused on that

point, and it might help if we try and separate the two possible mechanisms for settlement that he might have been relating to. The first would deal with sediment due to consolidation of the unfrozen soil, overlying the permafrost, and I mentioned in the additional testimony that that couldn't exceed a matter of a few inches at the very worst. The other concept that he mentioned in the testimony was this possibility of thaw consolidation due to -- settlement due to thawing of the permafrost underlying the pipe.

Q Yes sir.

A And I think that that's what you're after.

Q Yes, it is.

A We have -- we've done some work on the thaw strain of the soils in the delta, which indicated a thaw strain of 14%. This was not soil taken from Shallow Bay, but a very similar soil. If you applied that to the potential depths of thaw, you would get something in the order of a foot to a foot and a half potential settlement. Now, first of all, we don't anticipate that there will be thawing in the vicinity of the pipeline, being as how it's a chilled line, that would not be anticipated.

The second thing is that we do have cores of the permafrost material that were taken from beneath Shallow Bay, and part of those cores were sent to Professor MacKay at U.B.C. for his analysis, and they are so ice-poor, if you like; or putting it another way, there is so little excess ice,

Cooper, Hollingshead, Williams,
Pinning, Clark, Purcell
Cross-Exam by Goudge

1 which would contribute to any significant thaw settlement,
2 that he had difficulty, in fact could not extract enough
3 water to analyse, to do the testing and analysis of the
4 water that he wanted to do. The lenses are in the order
5 of a millimeter thick, and it's simply not ice-rich
6 material. It's -- there's very little excess ice, so that
7 one would not anticipate a thaw strain exceeding say
8 10 to 14%, which would, even if you assumed the worst,
9 and said that it could thaw down over the next fifty
10 years life of the project, that the maximum settlement
11 you'd be looking at would be something in the order of
12 a foot.

13 Q And is that something
14 that is built into your design?

15 WITNESS CLARK: That wouldn't
16 produce a sufficient stress to give us much concern
17 there, movement of that order. That's based on the
18 thawing of the permafrost underneath, if there were no
19 pipe present, so with the pipe there, you actually won't
20 get settlement, because we'll still get some heave, just
21 due to the in situ freezing, and a small amount of ice
22 lensing until we reach the shutoff pressure.

23 Q And the two may balance?

24 A If we were very very clever
25 we should maybe do that. No I suspect the overall result
26 will be one of heave, rather than settlement. A fairly
27 modest heave.

28 Q Now finally relating to
29 the Shallow Bay crossing, Mr. Williams, let me come to
30 you and discuss the matter of its construction. You

Goudge, Hollmerheide, Williams,
Minning, Clark, Purcell
Cross-Exam by Goudge

1 addressed yourself yesterday to the prospect of
2 constructing that crossing in winter, and I took you
3 to express a single major concern, and that is the
4 loss of life of the construction crews.

WITNESS WILLIAMS:

5 A Yes sir.

6 Q Is that a problem the
7 solution to which presumably by prevention of drowning,
8 you have given any engineering attention?

9 A Oh, just the alternative
10 that I did discuss yesterday, Mr. Goudge, of the
11 possibility of doing part of it in the wintertime
12 and part of it in the summertime.

13 Q Yes, I take it this
14 problem of construction on ice in the winter where
15 there's a water flow underneath of something in the
16 order of six feet, may present itself to you elsewhere
17 on the main line.

18 A I don't think so, Mr.
19 Goudge, to any appreciable extent. You know, if you
20 take the next largest river out rather than the major
21 crossings that we've talked about, the Hare Indian,
22 for instance, is a fairly substantial river in the
23 summertime, but our observations show that in the
24 wintertime, when you have three feet of ice, there's
25 only at about three feet of water at most below the
26 ice, and I wouldn't consider this a hazardous
27 situation.

28 Q What about the Willow
29 Lake River, for instance?

30 A I'm not certain if we

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Goudge

1 have any winter measurements at that location.

2 Q I take it however, in
3 any event, it's not a problem that you've taken any
4 steps to address on the trunkline, this problem of --

5 A It's certainly been
6 given consideration, but as I say, I'm not sure of
7 the specific depths at Willow Lake, but generally the
8 flow diminishes considerably in the wintertime, of those
9 rivers coming in from the east, and in most cases,
10 there might be the odd exception, but in most cases the
11 depth of water below the ice will be pretty small.

12 Q Is it the general practice
13 of the pipelining industry in this country to avoid
14 winter crossings of water bodies where there is water
15 of more than six foot depth in the winter?

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

1 A Well, that is something
2 that has been done, Mr. Goudge. The, for instance,
3 the Peace River has been crossed, I know, in the winter-
4 time but generally you're, we're speaking about
5 pipe that is a fair bit smaller than what we are talking
6 about here and between the coated of pipe and the
7 equipment that's required to install it, the situation
8 that we're talking about at Shallow Bay, I think is
9 worse than what has gone on in the past in the south.

10 Q Isn't it fair to say
11 though that the experience in the past in the south
12 has not been that bad as far as this issue is concerned?

13 A That's, I think that's
14 correct but the magnitude of the pipe is a large factor.

15 Q Your view is that the
16 magnitude of the pipe and presumably to be fair, the
17 magnitude of the equipment, increases the risk to
18 life?

19 A Yes, sir. In this parti-
20 cular case that we're discussing.

21 Q Do you have any other
22 major objection besides this one to a proposed winter
23 crossing of Shallow Bay?

24 A Well, there certainly
25 would be a problem in trying to keep the channel open
26 where the excavation had taken place and if it is
27 going to freeze back up again and then if you are
28 required to -- if you have to pull the pipe in below the
29 ice, underneath the ice, I think there are potential
30 problems there. You can't monitor it or the flotation

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

1 tanks that you would like to put on to keep the
2 bottom resistance down -- I don't know what the-- how
3 the flotation tanks would work against, floating against
4 the ice.

5
6 Then the problem of
7 removing the flotation tanks when you are finished -- if
8 you have an ice cover over top. These sorts of things.

9 Q The major problem, I
10 take it, remains that of the threat to life?

11 A That is my major concern.
12 Other people may disagree.

13 Q And I take it as a
14 consequence, you propose the summer crossing and that's
15 done as you have told us through dredging?

16 A Yes, sir.

17 Q Just to elaborate for
18 my curiosity, is the dredge you propose for Shallow Bay
19 a bucket dredge or a suction dredge on the --

20 A A suction dredge.

21 Q A suction dredge?

22 A Yes, sir.

23 Q And your cost estimates
24 include only one dredge of the capacity required for the
25 Shallow Bay crossing?

26 A That is correct.

27 Q Given that you express
28 some concern about the schedule available to cross
29 Shallow Bay, is it too naive to suggest that a second
30 dredge of that magnitude would half the time?

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

1
2 A I wouldn't think quite,
3 but it would get up towards that.

4 Q If it takes 17 days to
5 run one dredge across Shallow Bay to dig the trench,
6 it presumably, you presumably cut at least 17 days off
7 by having two dredges that work simultaneously.

8 A For the straight
9 excavation work, yes.

10 Q And I take it for the
11 backfill work, you cut the time in half?

12 A Yes.

13 Q Yes, so that if for
14 environmental reasons the open window, if I can use
15 that phrase available across Shallow Bay between
16 the whales and the birds is very small? The use of
17 a second dredge may permit you to get the crossing in,
18 in one summer?

19 A It is possible, Mr. Goudge.
20 I think it would be a real tight fit though, taking
21 into account the other operations that are required in
22 addition to the dredging.

23 Q Well, surely all those
24 other operations can go on simultaneously with the
25 dredging?

26 A Not the pulling operation.

27 Q That's the only one?

28 A Or the backfilling.

29 Q Except for those two.

30 A Yes, sir.

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

1
2 Q And together they
3 encompass five days?

4 A Those were rough numbers
5 that I gave that I am going to check in Calgary.

6 Q Perhaps when you are
7 putting together those numbers, Mr. Williams, you would
8 be good enough to provide a second column on the
9 assumption that there is a second dredge. Could you
10 do that?

11 A Yes.

12 Q Now, assuming -- have
13 you given any thought, given that your present proposal
14 is for only one dredge to, and this is because it
15 relates to the disposal of spoil and the consequences
16 that that may entail. Have you given any thought to
17 the problem of which ditch is to be dredged first -- the
18 upstream one or the downstream one?

19 A I think if everything else
20 is equal, we would probably do the downstream one and
21 put it in and while excavating the upstream ^{one} to backfill
22 the downstream dredge.

23 Q Now, finally, sir and we
24 could perhaps then break for lunch as it would be an
25 appropriate point for me. Just as a matter of
26 clarification, you were asked yesterday whether Shallow
27 Bay or whether on any of these crossings, boat traffic
28 would be disrupted and I think you said that as far as
29 you were concerned, these crossing activities would at
30 no time disrupt boating activity and I wondered if you

Cooper, Hollingshead, William
Minning, Clark, Purcell
Cross-Exam by Goudge

1 included the pull activity in your response.

2
3 A Yes, I did and I was sure
4 the question was with respect to small craft used by
5 people in the area. I am sure accommodation could be
6 made for tug traffic, the buoyancy tanks would be
7 visible, the pipe would be well below the water surface.

8 MR. GOUDGE: I see. Thank you,
9 sir. I'm proposing to move on to a new subject.

10 THE COMMISSIONER: What time
11 is it now?

12 MR. GOUDGE: It is about 25 to
13 1.

14 THE COMMISSIONER: And how
15 long will you be this afternoon?

16 MR. GOUDGE: I would think I
17 will be another hour and a half, sir or perhaps a little
18 longer.

19 THE COMMISSIONER: Okay, well
20 let's come back at two then.

21 (PROCEEDINGS ADJOURNED UNTIL 2:00 P.M.)
22
23
24
25
26
27
28
29
30

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Goudge

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

MR. GOUDGE: Before I recommende,
Miss Lane asked me if she could say something.

MISS LANE: Yes, I would like
to remind the Commission that during December, Dr.
McCart and Mr. Jackimchuk agreed to make available
of list of recommendations of their environmental
recommedations to Arctic Gas and at that time, they
agreed that they could be available within one month.
Now, around February the 24th, Mr. Anthony was advised
by Mr. Marshall that these were still not available.
That was some two months after the promise was made and
another month has elapsed and I'm wondering if I could
ask Mr. Marshall when these will be ready, particularly
in view of the fact that the environmental panel will
be appearing again next week.

MR. MARSHALL: Neither Mr.
Hemstock nor I can answer that now. We'll phone them
this after -- we'll phone the two individuals this
afternoon and see if we can get an answer for you, Miss
Lane.

MR. GOUDGE: Gentlemen, if
I could move with you from Shallow Bay to the delta
channels and pick up one or two questions that may be
unique to them. I wonder, Dr. Cooper, if you have with
you the study called "Preliminary Design of Four Major
Water Crossings on the Cross-Delta Pipeline Route".
Would you look please at the contour sheet relating to
the north Reindeer Channel crossing which I think we've
referred to as the Middle Channel crossing?

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Goudge

1 WITNESS COOPER: O.K. I have
2 it.

3 Q These profiles I take
4 it were done as a result of work performed in September
5 of 1974?

6 A There have been more since
7 -- more soundings since then. I think these are the
8 combined results of either two or three field programs,
9 I think.

10 Q I took that from the
11 note you'll see on the document which, in item two,
12 says "date of survey September 24, 1974".

13 WITNESS HOLLINGSHEAD: Yes,
14 you're correct. Those contours represent the results
15 of soundings which were conducted in September, '74.

16 Q Yes. Now, as I read those
17 contours and, if both you gentlemen would address your
18 minds to this, they seem to show two relatively deep
19 holes in the channel; one on the righthand side
20 descending to 107 feet and the other on the lefthand
21 side descending to 80 feet with the pipeline crossing
22 between them. Is that a correct reading of that
23 diagram?

24 WITNESS COOPER:
25 Yes, that's correct.

26 Q Yes. Now, Dr. Cooper
27 to what do you attribute those two holes that I referred
28 to?

29 A Well, the 80 foot hole
30 on the lefthand side of the drawing, I would attribute
31 it to the effects of the confluence, the two upstream

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Goudge

1 channels. The downstream hole is in part, possibly
2 due to the constriction that's imposed by that arm
3 coming out on the left of the channel and in part,
4 we might expect to find some cohesive sediments in that
5 area.

6 Q Is there any likelihood
7 in your view that these holes are mobile?

8 A Not mobile in the sense
9 that they could migrate to the region of the crossings.
10 The upstream hole is going to be fixed at that crossing,
11 or at the location of the confluence and in the down-
12 stream area. The hole on the downstream end would be
13 fixed by the, possibly, an erosion resistant formation
14 and possibly the protruding arm on the left -- left of
15 the channel.

16 Q So you're confident, I
17 take it, that the holes you see on that diagram would
18 not migrate into an area adjacent to your pipe so as
19 to pose a threat to it?

20 A Yes, those two particular
21 holes, I'm quite confident of that.

22 Q Yes. Now, it looks to
23 me as if there is an area of major flow in the river
24 between those two holes on the righthand side of the
25 river looking downstream.

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

1 A Yes, most of the flow
2 is concentrated towards the right hand side. The channel
3 is quite uniform in between the holes in that respect.

4 Q Now, would it be the
5 case that the bed of the river is of such a character
6 that at breakup when the flow is rapid, you might find
7 the depth at the point where your pipe crosses to
8 deepen substantially and in effect produce a trench
9 between the two deep holes?

10 A No, sir, again in this
11 area, during breakup, the flow is not rapid as we would
12 expect on the Mackenzie River Proper. The reason for
13 that is the flow area within the delta is, well, I
14 would estimate an order of magnitude greater than it is
15 in the main arm of the Mackenzie River upstream of the
16 delta. The potential for breakup related jams which
17 could thicken rather than lengthening is not there as
18 water level rises with the increasing flows which do
19 occur at breakup, the ice surface just rises as well.

20 So we don't have potential
21 for scours at that time.

22 Q Let me ask you then
23 and this perhaps putting the question simply in another
24 way. If you took a similar profile as of June rather
25 than September; that is, as of the period immediately
26 following breakup, does your view say that the profile
27 would look almost the same as the one we're looking at?

28 A It could look somewhat
29 different but I wouldn't expect a great variation, no.

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

1 Q The difference, I take it
2 though, would be that you would find deeper, you would
3 find an increasing depth between the two holes?

4 A I wouldn't be surprised
5 if in one, if you took soundings immediately following
6 breakup in a number of years, that in some years you
7 might find depths that are somewhat shallower and in
8 other years, you might find depths that are somewhat
9 greater than are indicated on this particular contour
10 plan.

11 Q All right. Well, dealing
12 with that range of possibilities and keeping in
13 mind that the area we're talking about is where the
14 twin pipes cross, what kind of variation on the deepening
15 side might you anticipate as a maximum because clearly
16 that's what you would have to design for?

17 A I would have to go into
18 some considerable detail on the computations to
19 arrive at that number.

20 Q Is that work that you have
21 yet to do?

22 A I have not done that
23 work myself in the form of a detailed review of these
24 designs, no.

25 Q I take it that work is
26 necessary to know the depth to which these crossings
27 will have to be made.

28 A To, before we would fina-
29 lize a design, these detailed calculations would be made.
30 Yes.

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

1
2 Q And Dr. Hollingshead,
3 they have not been made by any as to date?

4 WITNESS HOLLINGSHEAD: A That
5 is right. The designs have not been finalized in that
6 sense. I might just add that detailed soundings
7 producing diagrams similar to those which you are looking
8 at have also been made in 1975. That is subsequent to
9 the data which you are looking^{at} would confirm the --
10 essentially confirm the existence, size and shape of
11 these.

12 Q Were those the ones made
13 in April of '75?

14 A No, the program I am
15 thinking of was later in the year. It was out in
16 August in '75 and the data hasn't been published but
17 it in essence confirms the bed topography at each of
18 the crossing reaches--

19 Q My concern though
20 relates to the bed topography immediately following
21 breakup after -- immediately after the river has
22 experienced its maximum flow. And I take it, you have
23 done no soundings of any of the major crossings at that
24 point in time to compare them with your profiles
25 obtained in September.

26 A We have not done any
27 soundings in late June or early July along the cross-
28 delta portion of the route, no.

29 It is our intention to
30 do so as soon as possible this summer coming; that is,
31 in 3 or 4 -- 2 or 3 months time, just after breakup.

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

1
2 Q And Dr. Cooper, your
3 opinion is that those soundings in some years immediately
4 after breakup might produce rather deeper indications
5 at the point of crossing than the September profile and
6 in other years, rather shallower?

7 WITNESS COOPER: A Yes,
8 the concept that when the higher flows occur when
9 the river is at its flood -- when these higher
10 flows do develop, you are not necessarily going to get
11 a general deepening of this channel. It is the same
12 as the analogy I presented this morning that admittedly
13 you will get greater transport levels but this need not
14 result in scour and the crossings are located at a
15 point where you wouldn't expect local scour. You are
16 at the downstream of a natural scour hole that was at
17 that confluence so I don't think that one can generalize
18 that at the higher discharges you are going to get
19 additional scour.

20 Although you would expect
21 some fluctuation one way or the other.
22
23
24
25
26
27
28
29
30

Chapel, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Goudge

1 Q There is enough doubt in your
2 mind as to the degree of that fluctuation, that further
3 research is, in your view, desirable?

4 A No sir, I think the
5 program that is planned, and the detailed review of
6 these findings, is essential before the designs are
7 finalized. But, I think that I would be willing to
8 make a final design recommendation, that this crossing
9 based on a detailed analysis of the data we have now,
10 I think it is to some extent additional information,
11 and just additional certainty in the judgement areas
12 that justifies going out and getting additional data
13 here over the next year or so.

14 Q Now Dr. Cooper, when
15 you were here earlier, in the Inquiry, you spoke about
16 what I can call perhaps unexplained holes in channels,
17 and I simply use this opportunity to ask you whether
18 the further studies of the origins of such holes, that
19 I think you indicated were being undertaken, have been
20 completed.

21 A Yes sir. Okay, I think
22 I can possibly explain it without referring to reports.
23 What you do find in the delta channels, in some of the
24 delta channels, and you find it in other rivers as well,
25 is you find a rather -- rather deep, although not
26 unusually deep depression in the bed, at a location that
27 you might not normally expect, strictly on the basis
28 of river mechanics, where you have a completely mobile
29 bed. Locations where you would expect holes, and I
30 think we've discussed this before, are locations such

1 as a confluence, or on the outside of a bend, but
2 where we find a hole that, say may tend toward the
3 inside of a bend, the location, more than anything else,
4 is somewhat unusual. Now, the program that we were
5 talking about, dealt with one of those holes I believe
6 on the original crossings on Langley Channel. Yes,
7 okay, I'm sorry, East Twin Channel.

8 One of the holes that we were
9 concerned was located in a place we wouldn't normally
10 expect it, was examined. Samples were taken, and we
11 found the upstream portion of that hole had a layer
12 of quite cohesive and quite erosion resistant material.
13 Well, to me, that explains the cause of it. The channel
14 wants to deepen itself there, somewhat; because it
15 can't, this erosion material or resistant material
16 acts as a sill, and you get a hole forming downstream
17 of it.

18 Of the holes that are located
19 in the near vicinity of the crossing that might affect
20 a crossing, I think they've been explained, yes.

21 Q So that in your view, none
22 of the major crossings in the delta that we speak of,
23 are flanked in any near sense by unexplained holes.

24 A In a near sense that I'm
25 concerned about at this stage, no.

26 Q One other aspect -- the
27 last aspect I want to deal with you on these delta
28 channels, Dr. Hollingshead, is the matter of erosion.
29 I take it in the major channel crossings that we're
30 dealing with here, that while erosion potential may not

Cooper, Hollingshead, Williams,
Manning, Clark, Turcott
Cross-Exam by Goudge

1 be the same as that we spoke of this morning on the
2 west bank of Shallow Bay, it's nonetheless something
3 that is of concern to you.

4 WITNESS HOLLINGSHEAD: It's
5 a significant factor that has to be considered in the
6 design, yes.

7 Q And this is erosion
8 due rather more to currents than wave action.

9 A Yes sir.

10 Q And once again you run
11 the risk, if you do nothing, of having the pipe become
12 exposed after a certain amount of erosion.

13 A No sir, I think in most
14 every other case the pipe will be sufficiently set
15 back that there is no danger of exposure of the pipe.

16 Q Well, one of the techniques
17 that you would postulate to control any adverse impact
18 would be setback, and the other I take it would be
19 bank protection, the same two we discussed this
20 morning.

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Goudge

1 A That's right.

2 Q Are you proposing as
3 far as you're concerned, to opt for the setback technique
4 here as you appeared tentatively at least to do for
5 Shallow Bay.

6 A Well, I don't think we
7 should rule out the possibility of using bank protection
8 but I think that this is a question of final design
9 and it may be that in fact, Dr. Clark, I think expressed
10 it probably the best, that one might adopt a compromise
11 solution and establish sufficiently adequate setback
12 to allow^{you} a monitoring period, if you wish so that
13 you could watch these crossings over a period of time
14 and if bank protection measures appeared necessary
15 or desirable at a later stage, that this could be
16 implemented.

17 Q The type of protection
18 device you're contemplating at this stage is the
19 gabion?

20 A It would be some form
21 of bank revetment and the gabion is a good possibility.

22 Q Are there others on
23 your list of options?

24 A Well, if you just use
25 riprap material -- larger size material, you don't
26 need the gabion type of structure.

27 Q There is an added
28 difficulty, is there not, with erosion in these river
29 banks that may not appear further south and that is
30 the permafrost content of the bank which may exaggerate

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Goudge

1 the speed or accelerate the speed of the erosion?

2 A Well, on the contrary,
3 I think there's a fair bit of evidence which would suggest
4 it may slow down the erosion which would otherwise
5 exist.

6 Q What's the explanation
7 for that? As a layman, I would have thought permafrost
8 in the bank would accelerate the erosion.

9 A I should perhaps let
10 Dr. Cooper answer that one, since he wrote a paper on
11 the subject, but, --

12 WITNESS COOPER: All right,
13 if you take a channel that's incised into a relatively
14 erosive material , say it has sand or sand and silt
15 banks, when you increase the -- or when you get at
16 flood stage, you get bank erosion and this causes
17 migration. Now, I'm talking about the southern case
18 where we don't have permafrost. Leaving the delta
19 for the moment, where you can -- let's say you're on
20 the Peel river and you get quite a variation in your
21 floods, you can get some extreme erosion events and
22 if you look at the erosional history of a bank, you'll
23 get, in an extreme flood, a situation where a bank
24 might migrate 50 or 100 or more feet. I've seen cases
25 on the Liard River, an area of Watson Lake where you
26 can get up to 100 feet in one year. This'll be followed
27 by years where you won't get any erosion.

28 So it's -- you get great
29 variation from one year to the other. Now, when you
30 add permafrost to this situation, it becomes much more

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Goudge

1 steady. You -- when the permafrost melts close to
2 the bank and you get, if you like, an active layer,
3 this will erode relatively easy. But during the
4 course of that flood, you ^{then} come against the frozen
5 material and it's relatively resistant to erosion
6 for the period of the flood. So, the net result is
7 you may get five ^{feet} one year, twelve feet the next, and
8 it's much more constant. The chances for a very large
9 amount in one year, just aren't there.

10 Q Although the chance for
11 a regularly occurring substantial amount are perhaps
12 increased?

13 A They're ^{there} as they are in
14 the other instance.

15 Q Now Mr. Williams, if I
16 could come to you and deal with the construction techni-
17 que you propose to lay the pipe across the delta islands.
18 This is as opposed to laying ^{it} under the crossings -- or
19 laying it under the water bodies. As I understand it,
20 you're proposing two ditches fifty feet apart.

21 WITNESS WILLIAMS: Yes sir.

22 Q That means two spoil
23 mounds and so on?

24 A Yes sir.

25 Q I take it you haven't
26 prepared any of those nice right-of-way diagrams that
27 we saw for the trunkline?

28 A No, we haven't.

29 Q If your draftsman is
30 still at work, it might be helpful if you could and I'll

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Goudge

1 tell you why, because it puzzles me as to how you're
2 going to get those two trenches in the right-of-way.

3 Do you propose to dig them both at once?

4 A What width of right-of-way
5 are you thinking of Mr. Goudge?

6 Q Well, I think that's
7 my next question.

8 A We're thinking about
9 170 feet.

10 Q 170 feet?

11 A Yes sir.

12 Q So that you simply
13 tack fifty feet on?

14 A Yes sir.

15 Q That satisfies me a
16 little because at 120 feet, it looked crowded.

17 A Yes, I think if you,
18 you know, take the acreages shown on the strip maps,
19 you'll see that that probably calculates to 170 feet.

20 Q Well, assume 170 feet,
21 are you planning to dig the trenches at the same time?

22 A Oh, it's a possibility,
23 Mr. Goudge. We really haven't gone that far in the
24 detailed planning.

25 Q Yes. I take it if you
26 did that, the trenching machines would be running in
27 the same direction because as I recall, they can only
28 work on one side.

29 A The trenching machines
30 can throw out the spoil either side. It's the side

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Goudge

1 booms that are --

2 Q Yes.

3 A -- restricted to one
4 direction.

5 Q Now, once the pipe is
6 available to be tested, do you propose to use methanol
7 there as everywhere else to test your pipe?

8 A Yes sir.

9 Q I take it you perhaps
10 agree, although this is rather more for the environmental
11 people that the disposal of the methanol test fluid
12 is perhaps even more critical in the delta area than
13 elsewhere?

14 A Yes, that -- if the proper
15 procedures for the disposal are used, I wouldn't see
16 it as more of a problem, Mr. Goudge. If --

17 Q You haven't at least
18 contemplated because of any environmental sensitivity
19 of the delta, going to other pipe testing mechanisms
20 in the delta?

21 A No sir. I haven't, other
22 people may have.

23 Q Not with --

24 A I don't know if Mr.
25 Purcell is aware of any other recommendation made in
26 that respect.

27 WITNESS PURCELL: No, I'm not.

28 Q What about testing with
29 water -- testing the portions under the water crossings
30 with water? Has that been considered? That would

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Goudge

1 entail summer testing given the summer construction.

2 WITNESS WILLIAMS: I don't
3 think so, Mr. Goudge. It's a possibility but the
4 string of methanol that is moved on down the line for
5 sectional testing would still have to go through that
6 -- the water section. I don't know if there'd be a
7 great advantage to it.

8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

Q It could be done though,
could it not?

A I suppose. We might have
a little concern about the banks where you come into
the permafrost but I am sure it can be done, yes.

Q Now, let me move to you
Dr. Clark, in ^{relation to} the nature of the soils on the delta
islands. We heard a good deal from Dr. Lewis in Inuvik
as to the complexity of the soils in the delta area.

Would your view generally
be that there is that complexity?

WITNESS CLARK: A I think
overall one would say it is relatively homogeneous but
there is -- it is predominantly silt and sand. They
occur in varying proportions. There is some clay and
organic material as well. We have found relatively
consistent densities higher than we had anticipated.

Q There may be a variety of
vertical pattern, if I can put it that way.

A Yes.

Q And a variety of permafrost
patterns in the sense that there are pockets of unfrozen
soil down to depths throughout the delta on an irregular
basis.

A Yes, sir.

Q There is perhaps a variety
of surface conditions across the delta.

A I am not sure what you
mean by "surface conditions", Mr. Goudge.

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

Q Well, in some areas, you have very wet surface areas and in other areas, it is relatively dry.

A Yes.

Q So that it isn't perhaps accurate for us to think of the soil conditions in the delta as being in any sense homogeneous.

A In a textural sense, they are relatively homogeneous. You are right. They occur in different stratifications.

Q And that these variations that we have spoken about all have a relevance for the engineering to be taken place on the delta?

A Yes, sir.

Q Now, dealing particularly with the permafrost distribution on the delta you have acknowledged just now and earlier that there are these unfrozen zones. To what extent has their location been plotted on the delta at least insofar as your route is concerned?

A Not in the final detail. We have drilled particular features such as shallow lakes, overland areas and on the water but we haven't identified all of the unfrozen zones. At least I don't believe that we have.

Q The existence of these unfrozen zones at least as I understood the course we have had on frost heave, creates a frost heave problem.

A It could, yes.

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

Q And you would have
the pipe passing as chilled pipe from frozen soil into
unfrozen soil.

A Yes, exactly -- not
exactly, but very similar to what we have in the
discontinuous permafrost zone.

Q Yes. And in fact the
frequency of that kind of passage across the delta
is at this stage undetermined because you haven't
identified the various pockets of unfrozen soil through
which your pipe will pass?

A I would think that based
on air photo interpretation right now we could probably
make a very good estimate but we would want to have
field work to be more precise about it; specifically
a geophysical program there.

Q Yes, but you have no
doubt, I take it, that you will have to undertake frost
heave control measures across the delta.

A I don't foresee the
requirement for^a berm, a surcharge loading on the
surface of any soils in the delta.

Q You don't see that as
a need but will you have to turn to other devices?

A Not a device, Mr. Goudge,
the burial in the river crossings will just have to
be deep enough to make sure that the rate of heave
was within our tolerable limits. On the overland areas
the 10-foot depth to the bottom of the ditch, I believe,
will satisfy that requirement now for any minor unfrozen

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

1 areas that we encounter.

2 Q Yes, in fact, isn't it
3 so that a berm would probably not be a practical
4 control device on the delta because of the storm
5 surge difficulty?

6 A No, I don't think that
7 would rule out a berm. Maybe I'm not interpreting
8 the context of what you are saying.

9 Q Well, would you view
10 storm surges -- suppose you did have to go to a berm,
11 that deep burial didn't do it for you. Would you worry
12 about your berm being threatened by storm surges?

13 A It would have to be
14 made of material that would resist any erosion during
15 a storm surge.

16 Q Do you feel that the
17 normal kind of material you look to for berms of this
18 kind elsewhere in the valley would resist?

19 A No.

20 Q So you would have to have
21 special overburden material?

22 A It would have to be --

23 Q To build berms, ^{should} you need
24 them.

25 A Yes, granular material
26 sufficiently coarse to resist erosion.

27 Q Let me turn from heave
28 then, Dr. Clark, to buoyancy because that is another
29 problem you face in the delta as well.

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

1 A Yes, sir.

2 Q And you have said I think
3 that frost anchors and weights are your proposal there.

4 A Yes, sir.

5 Q Are you concerned about
6 buoyancy primarily in that stage of the evolution of
7 the pipe until it is chilled?

8 A Yes, sir.

9 Q Are you concerned at
10 all about it thereafter?

11 A For a short period
12 thereafter, yes.

13 Q Why a short period?

14 A Until the frost bulb is
15 sufficiently established to prevent buoyancy.

16 Q And by that do you mean
17 until it freezes down to the permafrost bed?

18 A Are you thinking of
19 Shallow Bay now or --

20 Q Well, I am thinking of
21 the land areas of the delta.

22 A Most of it will be in the
23 permafrost bed but in any unfrozen portion of the land
24 area, it wouldn't necessarily be down to the permafrost
25 bed but it would be until the backfill up to the normal
26 active layer depth was frozen.

27 Q I see. That means then
28 that the frost anchors and weights are relevant to what --
29 the first two years of the pipe being in the ground?

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

A About that, yes.

Q As between those two
devices, frost anchors and weights, do you have a
preference?

A I do, yes. I prefer the
frost anchor. Maybe Mr. Williams has a different
preference here.

Q Go ahead.

WITNESS WILLIAMS: A I
was just going to add, Mr. Goudge, that the cost
estimates reflect the use of anti-buoyancy control
to neither the form of weighting or frost anchors
across the full length of the delta but we have not
ruled out the possibility of substituting in some areas
ditch flooding as an anti-buoyancy control measures through
parts of the cross-delta route, but the cost estimates
do include full weighting or anchoring across the delta.

1 Q When you say that, Mr.
2 Williams, do you assume 50% of the line using frost
3 anchors, and 50% using weights, or what?

4 A Well, I should back off
5 a bit I guess and say that I think the cost estimates
6 are based on weighting, which, in our opinion, is more
7 expensive than frost anchors.

8 Q What kind -- sorry --
9 what kind of weights? Are they saddle weights or
10 bolt-on weights?

11 A I think in this case,
12 it's continuous concrete coating.

13 Q A continuous concrete
14 jacket?

15 A Yes sir.

16 Q Right the way from what
17 we call Milepost 319 roughly to Tununuk Junction?

18 A That's what's in the cost
19 estimate, yes. We don't think that that's what will
20 be done, but that's what's in the estimate.

21 Q I wonder if your
22 granular materials estimate includes that proposal?

23 A By comparison, that's
24 a pretty small amount, Mr. Goudge.

25 Q You don't, I take it
26 Mr. Williams, contemplate using gravel backfill as
27 a buoyancy control device?

28 A No sir.

29 Q Now sir, when you were
speaking yesterday of the work pads and wharves in the

1 delta, you said I think that the work pads are
2 proposed to be ten feet in depth, which I take it
3 brings them above the flood level.

4 A Yes sir.

5 Q And there is no
6 intention of having any work areas which are protected
7 from flood, by dykes alone?

8 A No sir, that's not
9 reflected in our gravel quantity estimates, or material
10 quantity.

11 Q And as well on your pads,
12 I take it, any fuel storage will be dyked?

13 A Yes sir.

14 Q And all your fuel
15 storage will be on the pads?

16 A Yes sir.

17 Q Are those pads to be
18 built in winter?

19 A I think we mentioned that
20 the possibility of using dredge material for the core
21 and finishing off with gravel, particularly if there's
22 resistance to taking that quantity of gravel from Yaya.

23 Q Well, we'll be coming
24 to that in a moment, but let me ask you about dredging
25 as well. There will be some barging at least of
26 materials for your construction purposes through the
27 delta channels?

28 A Yes sir.

29 Q Do you propose to dredge
30 any channels to facilitate the barging?

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Goudge

1 A Oh, it is possible that
2 some dredging will be required to get to the -- to the
3 docking area, but not dredging long lengths of channel,
4 Mr. Goudge, no.

5 Q Dealing specifically with
6 CD-08, which you've now moved, I was puzzled at not
7 being able to find an obvious wharf site, relating
8 to CD-08, and I wonder, given the heavy equipment that
9 will have to be moved to that site, whether you propose
10 to barge to Bar C and then move it over a river road
11 to the site, or have you tackled that problem?

12 A What heavy -- did you
13 say heavy equipment and material?

14 Q Such as the compressors,
15 how are you going to -- what route are you going to
16 take to get them to that site, now that you've moved
17 the site?

18 A I would see them being
19 hailed from Tununuk, north to the site.

20 Q On a river road?

21 A On a winter road, yes.

22 The channel that does
23 run near to the station site, I think is pretty
24 marginal. There's a possibility that you could get
25 in there in the early part of the season. It's just
26 my quick estimate of looking at hydrographic maps, but
27 it's a pretty shallow channel.

28 Q Then your maintenance
29 activities in the delta, I take it, are to be conducted
30 from a base either at Tununuk or Tununuk Junction?

1 A Yes sir.

2 Q And you'd acknowledge
3 I think that any activity in the delta that has to be
4 done in the summer is going to be very dicey, from
5 an environmental point of view?

6 A Yes sir.

7 Q Reading your evidence at
8 page 19779, where you list, I think, a good deal of
9 equipment, such as amphibious transport equipment, with
10 it being equipped with backhoes or A-frames, and gantry
11 type cranes, and hydraulic winches, and you additionally
12 mention balloon tired low ground pressure vehicles,
13 suggests to me that there may be some possibility of
14 regular summer maintenance in the delta. I take it
15 that's simply a bad dream on my part.

16 A I wouldn't see summer
17 maintenance ^{being done} by choice, Mr. Goudge. I can see that
18 some subsidence in the ditch line is going to take
19 place in the early years, and I think that that can
20 be repaired in the winter months, but --

21 Q You'd agree it's vital
22 to avoid regular maintenance in the summer in the delta?

23 A Yes sir.

24 Q So I take it this
25 equipment which you propose to collect at Tununuk, which
26 appears to be designed for summertime capability in
27 the delta, is there for the dire emergency situation?

28 A Yes sir.

29 Q That's despite the fact
30 that you twinned the pipe all the way across the delta?

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Goudge

1 A That's despite the fact.
2 If a failure occurred in a water crossing, it would
3 seem to me the logical time of year to repair it
4 would be in the summer, Mr. Goudge. Maybe I didn't
5 understand your question.

6 Q Well, I think I've asked
7 the question several times, and I don't need to trouble
8 you with another go at it. Now, Mr. Purcell let me
9 move to you for a moment, and take you back to earlier
10 evidence before the Inquiry, where Mr. Dau said at
11 page 1733 of the transcript that, quote,

12 "We have some limits in moving stations, you
13 know we cannot move them many miles without
14 suffering a large penalty in throughput.

15 Question: What is a major move, what is
16 a minor move?

17 Answer: A half a mile we can live with in
18 most locations, beyond that we get concerned."

19 I think sir, you can perhaps understand my layman's
20 surprise to find that you can move a compressor
21 station 16 miles, with relatively little difficulty,
22 from a hydraulic point of view. Now I take it I'm
23 correct that there is relatively little difficulty
24 from a hydraulic point of view?

25 WITNESS PURCELL: There is
26 an increase in fuel consumption, during the fourth
27 and fifth years, when that station is required, and
28 as I discussed with Mr. Gibbs, there would be a 'through-
29 put penalty if the Prudhoe Bay line were to be fully
30 powered.

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Goudge

1 Q The move of that compressor
2 station 16 miles suggests to me that there is the same
3 possibility concerning other compressor stations,
4 throughout the system. Is that so?

5 A There's more flexibility
6 on the stations on the Prudhoe Bay line, than on the
7 main line, up through the fifth operating year because
8 the Prudhoe Bay line is only carrying half the gas.
9 The penalty is smaller. On the main line there would
10 be a much larger penalty in fuel consumption, and
11 probably in capital costs, if you were to try to move
12 a station that far. It's not impossible, but the penalty
13 would be larger.

14 Q Yes. And is it possible
15 for you to say what a 16 mile move of a compressor
16 station on the main line would be by comparison with
17 the CD-08 move?

18
19
20
21
22
23
24
25
26
27
28
29
30

Cooper, Hollingshead, Williams,
Anderson, Clark, Linnell,
Cross-Exam by Goudge

1 A I haven't looked at it
2 specifically. In many cases, it depends upon the
3 particular station and the moves that have previously
4 been made. It depends upon the gradient that the
5 pipe is following, whether it's going downhill at the
6 time or going uphill. I can't -- don't believe give
7 you any specific numbers.

8 Q There would be however,
9 a penalty in throughput that you feel would be somewhat
10 greater than the penalty felt as a result of the
11 CD-08 move?

12 A The increased fuel
13 consumption would be greater and that fuel consumption
14 would come out of the throughput. So, the answer is
15 yes, I believe.

16 Q Yes. Without a specific
17 example in front of you, you can't say what the move
18 of similar length to a compressor station on the main-
19 line would do to cost as compared to the CD-08 move?

20 A No. When we discussed
21 this with, I believe Mr. Scott last year, we told him
22 we would prefer to examine specific instances rather
23 than try to give an answer that would encompass any
24 station.

25 Q Yes. There's no doubt
26 though, as you say that the move of any station presents
27 some cost and that, I take it, can be turned into what
28 you call an equivalent capital cost?

29 A Yes.

30 Q In the responses that you

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Goudge

1 delivered to the pipeline assessment group, there was a
2 passage that dealt with equivalent capital costs
3 entailed by the movement of stations. Do you recall
4 that?

5 A Yes. If I recall, the
6 generalities of it.

7 Q Let me read you a passage
8 from your responses at page 16-2 of the responses
9 where it said by your company that

10 "The effect of a move which reduces system
11 capability is to increase the unit cost of gas
12 transported and the increase in unit cost can be
13 expressed in terms of equivalent increase in
14 capital cost. For a single station relocation of
15 about half a mile, the equivalent capital cost
16 increase ranges from about \$2million to about \$5
17 million. For relocations of two to four miles,
18 the equivalent capital cost increase in the tens
19 of millions of dollars."

20 I take it that's accurate sir?

21 A Yes sir.

22 Q Does my layman's
23 mathematics lead to a correct conclusion when I
24 estimate that a 16 mile move would entail an equivalent
25 capital cost well into the tens of millions of dollars?

26 A It could do, Mr. Goudge.
27 What I think was done for the purposes of that study
28 and just in order to make the answer understandable,
29 was to determine the loss of throughput if the station
30 were moved and the size were not changed. I've kind of

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Goudge

1 forgotten the details of the study. It's been a long
2 time ago.

3 Q Well, I simply take it
4 on the basis that a two to four mile move entails an
5 equivalent capital cost, you say in tens of millions of
6 dollars. I move from that to a station move of 16 miles
7 and assume that the equivalent capital cost of that
8 is going to be well into the tens of millions of dollars.
9 Is that fair?

10 A At those fully loaded
11 volumes and applying the assumptions that were used in
12 that study, I'm sure you'd get that answer, yes.

13 Q Yes. I wonder sir, if
14 based on that, you've conducted any kind of study to
15 determine the equivalent capital cost entailed in the
16 move of CD-08?

17 A I have an idea for the
18 volumes up through the fifth year of the additional
19 cost in fuel, of that move.

20 Q What is that sir?

21 A The fuel penalty in
22 the fourth year is 120 million cubic feet per year,
23 and in the fifth year 140 million cubic feet per year.

24 Q Yes. Can you reduce
25 those penalties to dollar values for me?

26 A The cost of -- or the
27 value of ^{the} fuel gas hasn't been established, but I've
28 heard examples that range -- or guesses that range at
29 50¢ to a dollar a thousand cubic feet. At a dollar,
30 the numbers would be 120 to \$140 thousand a year.

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Goudge

1 Q Yes. I take it there
2 are other items that go into the production of the
3 equivalent capital cost of such a move besides the
4 additional fuel cost?

5 A In the case of CD-08, we
6 had some changes in piping and so forth that added
7 a little bit to the cost. For example, we had to add
8 two 48 inch scraper traps at Tununuk Junction.

9 Q Yes. I take it you'd
10 agree with me that however one computed the equivalent
11 capital cost of the move, once one got the total, the
12 net saving of the cross-delta route is the difference
13 between \$190 million proposed and the additional
14 equivalent capital cost of moving the compressor
15 station.

16 A Yes.

17 Q So that you have to
18 subtract if you want to find what Arctic Gas is saving
19 as a result of this proposal; the equivalent capital
20 cost of moving the compressor station.

21 A Yes, you would.

22 Q Do you have any idea
23 what order of magnitude of numbers or of dollars you're
24 talking about when you speak of the equivalent capital
25 cost of moving CD-08?

26 A There was an increase in
27 the cost of valves and scraper traps and so forth due
28 to the move to Tununuk Junction of \$100 thousand. This
29 is a special situation that wouldn't be typical of the
30 average move. It had to do with the elimination of the

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Goudge

1 four scraper traps at the previous location and the
2 addition of two 48 inch scraper traps at the junction.
3 But at any rate, it totalled \$100 thousand. That is
4 simply the price of the material components. It doesn't
5 include escalation or installation or indirect costs.
6 That would inflate it somewhat.

7 Q I wonder sir if it would
8 be asking too much to ask you to refer back to the
9 responses from which I quoted and perhaps use the
10 same methodology as was obviously behind that response
11 in calculating equivalent capital cost of the move
12 to determine the equivalent capital cost of moving
13 CD-08?

14 A It could be done. It's
15 a little bit difficult because, as I said, there is more
16 flexibility on that supply line because the volumes are
17 lower and there happened to be excess capacity at CD-08
18 and the next station that could come into play with
19 this move. The real penalty I don't think would show
20 up until the volumes went beyond those that are con-
21 tained in the application.

22 Q That is until the lateral
23 was fully powered?

24 A That's correct. Then
25 the penalty is a function of the volumes that are
26 flowing from the delta at that time. It becomes less
27 of an academic exercise than the response to that
28 deficiency letter, which was more typical.

29 Q Well, the response that I
30 quoted from paints a much blacker picture as I understand

Cooper, Hollingshead, Williams,
Hinning, Clark, Purcell,
Cross-Exam by Goudge

1 you of the cost of moving a compressor station than
2 what you've actually experienced with CD-08?

3 A Because that lateral
4 is not full.

5 Q Well sir, I would be
6 grateful if you could -- if you could prepare in brief
7 the equivalent capital cost as you see ^{it} and perhaps
8 supply it to Mr. Marshall of the move of CD-08 so
9 we could have that in addition to the response.

10 A Fine sir, I'll try to do
11 it.

12 MR. MARSHALL: Mr. Goudge,
13 do you really need that for purposes of this Inquiry?

14 MR. GOUDGE: Well Mr. Marshall,
15 I'm concerned about -- we've had a lot of evidence
16 earlier about the moves of compressor stations and
17 what they entail. The cost factor has been quoted in
18 detail. It may be that we or other participants may
19 have further to say about possible moves for environ-
20 mental reasons.

21 MR. MARSHALL: Well I think that --

22 MR. GOUDGE: If we're to have
23 this put in perspective, I think it's important that
24 we know what an actual move costs by way of equivalent
25 capital cost because otherwise, all we're left with is
26 a theoretical response which, in my submission, appears
27 to be rather inflated when one comes to a particular
28 example.

29 MR. MARSHALL: Well Mr. Goudge,
30 what Mr. Purcell has been trying to explain is that when

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Goudge

1 given to the assessment group question, we're dealing
2 with a typical situation of a move on the system as it
3 then was. The system has since been redesigned with
4 the cross-delta line and you're dealing with the move
5 of the station where there is excess capacity in it.
6 It's not a typical situation, so finding out what the
7 specific capital cost equivalent is of the move of
8 CD-08 sixteen miles east is going to tell you nothing
9 about what the equivalent capital cost figures would
10 be for a move of any other station. There's no
11 comparable situation. This is a unique situation and
12 that's what Mr. Purcell has been explaining to you.

13 MR. GOUDGE: Well, it's the only example
14 we have to go on and I'm concerned sir that we have the
15 detail of that example as a basis for submission, as
16 to others it may be that it will be argued that it is
17 atypical and one can't argue from the one example to
18 conclude anything about any other compressor station.
19
20
21
22
23
24
25
26
27
28
29
30

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

MR. MARSHALL: Why don't you have the argument right now. It is an atypical situation with no application to removal of any other station, and I, unless ordered otherwise, am of the view that there is no point putting the witness to that work.

MR. GOUDGE: Well, let me say, Mr. Commissioner, that without it all we have to argue about is what is in the response which appears to me to be at least on the example that we have, a figure which is much beyond the capital cost that appears with the one case we do have to look at. To put the thing in balance, I think it would be very useful to see what the capital cost is of moving the station that the applicant has actually moved.

MR. MARSHALL: You can't balance apples and oranges. You have got a situation where you have got a Prudhoe Bay supply line that is designed ultimately to carry $4\frac{1}{2}$ B cf per day and it is not initially carrying that and the move of that station on that line is going to have totally different cost, capital cost equivalents than the move of a station south of the junction.

You know, I am trying to be helpful, Mr. Goudge. It is not going to get you anything useful. It is going to put the witness to a lot of work and it is not going to help you.

MR. GOUDGE: What we have now, sir, is we have evidence based on the responses that I read which is that the equivalent capital cost of moving a compressor station 2 to 4 miles is in tens of millions

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

1 of dollars. Now, that is what is on the record now.
2 I am concerned that that is not accurate in the one
3 example that we have, and to obtain the inaccuracy I
4 want to have the witness's best estimate of what the
5 actual equivalent capital cost is, so that my friend
6 can't come along at the end of the day and say, "we can't
7 suffer the cost^{constraint} of moving a compressor station because
8 it is in the magnitude of tens of millions of dollars."

9 MR. MARSHALL: If you want to
10 pick a station that you want moved and pick a location
11 to which you want it moved, then we have got something
12 concrete to work with and I am sure Mr. Purcell could
13 work up an estimate of what the capital cost equivalent
14 of that sort of a move might be, but to do something in
15 the abstract is a make-work project in my humble
16 submission, Mr. Goudge. If you want to get specific
17 and cite a specific location that you want moved to
18 another location, I am sure that Mr. Purcell could
19 come up with some figures for you.

20 MR. GOUDGE: I was being quite
21 specific to ask about the one station.

22 THE COMMISSIONER: Did you want
23 to add anything to this? I saw you leaning forward
24 there. Does that just mean you are listening?

25 WITNESS PURCELL: Listening
26 intently, yes, sir.

27 MR. MARSHALL: It means I
28 probably had it wrong again, sir.

29 A: It is what we have told
30 Mr. Scott and I mentioned to Mr. Goudge a little while

Cooper, Hollingshead, Williams
Minning, Clark, Purcell.
Cross-Exam by Goudge

ago and what Mr. Marshall has said, I can only reinforce and that is that each situation is unique and that I agree with Mr. Marshall that this probably the most anomalous situation on the whole pipeline and it -- a calculation could be made but it would only fit the situation and Arctic Gas has already agreed to accept the penalty.

We can't -- there would be absolutely impossible to try to extrapolate this information to any other station on the pipeline.

THE COMMISSIONER: Excuse me, Mr. Goudge, what Mr. Purcell says certainly appears have a good deal of force behind it. He says you can't extrapolate the cost of that move to other possible moves of compressor stations along the route and Mr. Marshall says that being the case why don't we deal with it case by case and we only have one case so far -- well, we have others, Mr. Barry, Dr. Barry wanted to move the compressor stations on the west side of the delta but, and on the north coast but this is the only one that's been kind of taken apart and put back together.

MR. GOUDGE: Let me ask it this way, sir. I am concerned about the apparent generalization which is in the response. A relocation of 2 to 4 miles produces an equivalent capital cost in the tens of millions of dollars and that -- now if each case is unique that statement is not accurate.

THE COMMISSIONER: Well, excuse me, I see that point. You are talking about loss of

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

1 compression and so forth and amortizing that or
4 calculating it all back and working it in to the
5 capital cost figures, that is what the thing in the
6 responses is, isn't it?

7 A I believe what we did and
8 I wish I had reviewed that, but I believe what we did
9 was something like this. That we took the mainline
10 because that was the fully loaded part of the pipeline
11 that was the easiest to work with, and we said if we
12 move a station, we'll have a loss of throughput of
13 let's say, 1%. And that is equivalent on a capital
14 dollars per m.c.f. of throughput of increasing the
15 cost of the pipeline by 1% so you know, that would
16 be in the order of \$70 million or so, 1% of 7 billion
17 or whatever the number is, and the number that I mentioned
18 to Mr. Gibbs yesterday was that there would be a
19 throughput reduction of 1½% as a result of this move
20 if nothing else were done.

21 THE COMMISSIONER: That is the
22 move of that compressor station from the middle of the
23 delta to Tununuk.

24 A That is correct.

25 THE COMMISSIONER: Then what
26 you have done is you have powered up the one on the
27 west side --

28 A No.

29 THE COMMISSIONER: Oh, then
30 what you have you done to compensate for the loss of
31 compression you would otherwise suffer?

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

1
2 A Well, we had the
3 situation where this compressor station was not
4 required for 2 billion cubic feet a day from Prudhoe
5 Bay. That was in years 2 and 3. And we wanted to go
6 to 2½ billion cubic feet and that just did require this
7 station, and as a result of putting it in, it was only
8 half loaded and the next station that was ^{just} downstream of
9 the junction was only half loaded. Now, that's I think
10 a reasonable way to go about designing a pipeline.

11 THE COMMISSIONER: You say
12 this is an anomalous situation which is not encountered
13 on the main stem anywhere?

14 A Not anywhere near this
15 extent. There are from year to year, there is from
16 year to year some excess capacity.

17 THE COMMISSIONER: Now, let
18 me ask you this, if you bring 4½ billion cubic feet
19 along the Alaska's supply leg, when you reach, when
20 you seek to do that, will you be asking to reinstall
21 that compressor station in the delta?

22 A There are what we discussed
23 with Mr. Gibbs, three options as an alternative to
24 taking a reduction in throughput. One would be to,
25 I don't know if reconstruct is the best word, but add
26 an additional compressor unit and probably an additional
27 chilling unit at the station at the junction. That
28 would, depending on the gas volumes, that would remove
29 the throughput reduction. There would still be some
30 excess fuel consumption depending on the volumes from the

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

1 delta, there could be more compression added at the next
2 station downstream, or if the Prudhoe Bay's line is
3 full and there is gas from the delta there would obviously
4 be some looping on the main line and this pressure
5 reduction which is the cause of the throughput loss
6 could be compensated for by increasing the length of
7 the looping which might mean in a sense pre-building,
8 you might get a year ahead of yourself for one section
9 or so.

10
11 That is why it is so hard
12 to answer his question.

13 THE COMMISSIONER: Yes, well,
14 I think, Mr. Purcell has given us a lot of help here,
15 that he has explained how they got that answer in the
16 responses and you could probably add 50% to whatever
17 figure they gave in the responses in view of the
18 passage of time since the responses and the increased
19 estimate of the cost of building this thing. Well,
20 let's stop for coffee then.

21 (PROCEEDINGS ADJOURNED)
22
23
24
25
26
27
28
29
30

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Goudge

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

MR. MARSHALL: Mr. Commissioner,
Miss Lane asked about the list of recommendations
that Dr. McCart and Mr. Jakimchuk undertook to prepare,
and we've checked with them and they have both
indicated they can have something ready for Tuesday,
but not without great difficulty, and that satisfies
Miss Lane, I gather.

THE COMMISSIONER: They should
have not left it until this weekend, that's all I can
say.

MR. MARSHALL: It seems that
Miss Lane has a lot more influence with them than
either Mr. Hemstock or I.

MR. GOUDGE: Yes, Mr. Williams,
let me ask you one or two questions about a matter that
arises not so much out of the cross-delta filing, as
out of Mr. Marshall's letter, which was read in with
your evidence in chief, and that relates to the
proposed change you now have in your northern staging
areas. As I understand you, the major staging area
at Hay River, Enterprise is now effectively being split,
and Hay River, Enterprise will be maintained to some
degree, but as well you propose a major staging area
at Axe Point. Is that correct?

WITNESS WILLIAMS: Yes sir.

Q And you say in your
evidence that you've not yet determined the split in
terms of material handling, between those two staging
areas.

Cooper, Hollingshead, Williams,
Manning, Clark, Purcell
Cross-Exam by Goudge

1 A That's correct sir.

2 Q I take it though you
3 contemplate a split that may well see Axe Point taking
4 more of your material than Hay River, that possibility
5 certainly exists.

6 A I suppose so sir, as I
7 say the study is not finished, but that's always a
8 possibility. I don't know if that's Arctic Gas's plan
9 or not.

10 Q What you will have at
11 the Axe Point facility is to begin with, a major
12 trans-shipment point at Enterprise, then a routing
13 along the highway, then a new all-weather road to
14 Axe Point, and then a wharfing facility.

15 A Yes sir.

16 Q I take it that would
17 mean that manpower would have to be constantly
18 maintained at both Enterprise and Axe Point?

19 A Certainly as long as
20 any material was being moved, and that would be most
21 of the time, yes.

22 Q And if Axe Point
23 develops as a staging area, there would then be some
24 form of permanent living quarters at both Axe Point
25 and Enterprise.

26 A Permanent to the extent
27 of a camp facility, similar to other camp facilities
28 I would think, Mr. Goudge.

29 THE COMMISSIONER: You said
30 that there was a study that was underway. Who's doing

Cooper, Hollingshead, Williams,
Mining, Clark, Purcell
Cross-Exam by Goudge

1 the study?

2 A It's mainly Arctic Gas
3 staff, Mr. Commissioner, with some input from Northern
4 Engineering.

5 THE COMMISSIONER: When will
6 it be finished? It's a matter of importance. Mr.
7 Carter, you usually accompany us to community hearings,
8 to represent Arctic Gas. The hearing at Fort Providence
9 was to be this weekend, and fortuitously it's been
10 postponed indefinitely. The Axe Point development is
11 a matter of concern as much to Fort Providence,
12 presumably, as it is to Hay River or any other
13 community, and it would be helpful if we had that
14 study, before the community hearing at Fort Providence
15 takes place, so that people at Providence would have
16 some idea of the extent of the staging area that is
17 going in at Axe Point, and so that when we do have
18 that hearing at Providence, those at Hay River, concerned
19 about the problem, could come down and attend the
20 meeting, or -- yes, come down the river and attend
21 the meeting.

22 MR. MARSHALL: Sir, I wonder
23 if Mr. Hemstock and I could look into this over the
24 weekend, and let you know when the work will be far
25 enough along that we could give you something on that.

26 MR. GOUDGE: Perhaps, Mr.
27 Marshall as well, you could give us a general outline
28 of the nature of the study. In particular, is it
29 addressing itself to the impact on Hay River? I assume
30 it is, but it would be helpful to have that confirmed.

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Goudge

1 Now, Mr. Williams, is it
2 your proposal that the Axe Point site be devoted
3 exclusively to the Arctic gas operation?

4 A I would assume that if
5 the site was constructed by Arctic Gas, it would be
6 for that specific purpose, yes.

7 Q And the plan is that
8 it will be constructed by Arctic Gas, and used
9 exclusively by Arctic Gas.

10 A I don't think I can
11 answer that question, Mr. Goudge.

12 Q I wonder Mr. Marshall,
13 if you could indicate to us who could answer that.
14 I had assumed from your letter that Mr. Williams would
15 be able to --

16 MR. MARSHALL: I think you'll
17 see in my letter I indicated that Mr. Williams could
18 answer questions pertaining to the location of this
19 facility.

20 MR. GOUDGE: I can find it
21 on the map myself.

22 MR. MARSHALL: And as well
23 a description -- you know, a description of the site.
24 We have thought really that this is a matter that might
25 be got into in more detail in the next phase, which
26 is right around the corner, when when the Association
27 of Municipalities will be here. They're interested
28 in this subject as well.

29 THE COMMISSIONER: I agree
with you, and I'm sure you'll have that study by the

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Goudge

1 time we reach them, but I don't want to schedule this
2 hearing at Providence, until we know a little more
3 about the Axe Point development, that's all.

4 MR. GOUDGE: Well Mr. Marshall,
5 I take it then that we can look forward to a witness
6 from Arctic Gas in phase 4, who will address himself
7 to the relative advantages and disadvantages of Axe
8 Point and Hay River staging areas.

9 MR. MARSHALL: Frankly, Mr.
10 Goudge, I would have thought that Foothills had proposed
11 to use this location and had so announced a long time
12 ago, that you would have put a lot of your questions
13 concerning it, to them. But yes, we will have witnesses--
14 we'll be able to provide a witness to deal with this,
15 if you'd like to pursue it.

16 MR. GOUDGE: Well, I would
17 in terms of the relative advantages and disadvantages,
18 not only from a socio-economic viewpoint, but as
19 well from a logistic viewpoint.

20 THE COMMISSIONER: We'll set
21 that up for phase 4, we'll deal with it then. There's
22 no point in doing much about it until we have that study.

23 MR. GOUDGE: And I take it
24 sir as well until we get a witness who can speak to
25 the company's plans, things like who is going to own
26 the barges, who is going to own the facilities, and
27 that kind of thing.

28 THE COMMISSIONER: Right, well
29 let's get the studies first, then line up the witness,
30 and we'll deal with it in phase 4 .

MR. GOUDGE: Briefly Dr.

Clark, let me address one or two questions to you relating to the test holes and bore holes testing that has been done for the cross-delta route. I think your evidence in chief was that there have been roughly 156 test holes drilled, and -- or that was Dr. Hollingshead, but earlier in the Inquiry you indicated I think that there was a section of the cross-delta route near Travaillant Lake that stretched for about 30 miles without bore holes appearing on the alignment sheets. Do you recall that?

WITNESS CLARK: No I don't recall it Mr. Goudge.

Q It's at page 3611.

A Yes, I'll accept that but I don't recall it.

Q I wonder whether any of the drill hole data that has been accumulated for the cross-delta route addresses itself to that part of the cross-delta route, the Travaillant Lake hypotenuse, if I can call it that?

A Just granular material, test drilling in that area last summer.

Q There is then I take it a gap of some number of miles shown on the alignment sheets in that area where there are no bore holes, other than the granular material?

A Yes sir.

Q Do you have any plans to do any drilling in that particular area, to fill that

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Goudge

1 in in terms of bore hole data?

2 A Not prior to our field
3 program which would precede final design.

4 Q Why is that?

5 A Well, we have now, we
6 feel, so much verification of the terrain typing that
7 it's not needed at this stage.

8 Q I take it it would be
9 your view as well that the terrain typing in that
10 area is perhaps relatively homogeneous, and therefore
11 may not require frequent test holes?

12 A We believe it would be
13 quite similar to the other route, where we did have
14 drilling.

15 Q Now Miss Minning, let
16 me ask you a couple of questions about gravel and borrow
17 materials. First related to the supply of borrow
18 materials, I take it one of your -- one of your
19 objectives in preparing the granular material
20 information for Canadian Arctic Gas has been to
21 identify all those likely deposits of granular
22 materials within a reasonable distance of the cross-
23 delta line we've been addressing.

24 WITNESS MINNING: That's
25 correct.

26 Q And, for that purpose,
27 you use information from Dr. Mollard, and from Ripley
28 Klohn Leonoff, and from other studies that have taken
29 place.

1 A That's correct.

2 Q As well, you did some
3 field work yourself, I understand?

4 A That's correct.

5 Q The product of all that
6 is shown in the maps that you attached for us to the
7 tables you presented. Is that so? You attached three
8 maps showing one, the west side of the delta; two, the
9 east side; and three the southeast side of the cross-
10 delta route. Is that the -- is that a fair analysis
11 of the three maps attached to your tables?

12 A We have other maps that
13 are going to be coming out in our reports.

14 Q Well, addressing myself
15 to these three maps, do they record on them, all the
16 likely deposits of granular materials within a
17 reasonable distance of the cross-delta line, at least
18 that you've identified?

19 A On the west side of the
20 delta, yes. I think there may be a few on the east
21 side of the delta toward the southern end of the
22 one map that don't show.

23 Q But in general terms
24 at least, if I were to look at your three maps, I
25 would see the global picture as far as reasonably
26 available granular deposits are concerned for this --

27 A These maps were prepared
28 largely to substantiate the Tununuk Junction and
29 Yaya Esker deposits.

30 Q Yes.

Cooper Hollingshead, Williams,
Manning, Clark, Purcell,
Cross-Exam by Goudge

1 A -- or things that could
2 be used in addition to or instead of Yaya.

3 Q Right.

4 A That's why they were
5 prepared.

6 Q Right.

7 A There is another set of
8 maps that's going to be coming out with our reports
9 that show what was investigated in that area.

10 Q Which, from within these
11 deposits, were investigated. I take it that's what
12 those additional maps will show. Is that right? They
13 will take certain deposits shown on these three maps
14 and analyze them in more detail?

15 A That's right.

16 Q Now, as I read these maps,
17 no deposits of granular materials are shown from say
18 Milepost 319 to Tununuk Junction. There is no -- there
19 are no granular deposits in that area?

20 A That's right.

21 Q So that all the gravel
22 that needs to be used on that stretch of the cross-delta
23 route will have to come from one or other end of that
24 lake?

25 A That's correct.

26 Q Would you say that that's
27 the longest stretch of line in the applicant's proposal
28 that has that characteristic? That is, no gravel deposits,
29 no granular material deposits on it. Is that longest
30 stretch? It's a stretch of some fifty odd miles.

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Goudge

1 It would be, wouldn't it?

2 A Yes. I could say that
3 the southern end is probably fairly comparable from
4 Fort Simpson south and the Mackenzie highway south.

5 Q Now of these -- of these
6 deposits that appear on your maps, they obviously all
7 would appear on aerial photographs, I wonder if you
8 could tell me which of these deposits have been
9 investigated in other ways? Let me ask you for instance,
10 which of them would have been investigated by way of
11 flyovers by airplanes?

12 A I'm trying to find my
13 maps.

14 Q Oh sorry, just take a
15 minute and get them. I'm looking at the three maps
16 that you attached --

17 A That's right.

18 Q -- to your tables.

19 A Could you clarify what
20 you mean by "flying over"?

21 Q Well, let me go back
22 to it on a theoretical level. You can identify
23 granular deposits using aerial photographs alone.
24 You can, in a more detailed way, use aerial photographs
25 supplemented by some kind of flyover. You can, in a
26 still more detailed way, use aerial photographs combined
27 with flyovers and some surface sampling and I take
28 it the most detailed analysis would be the use of those
29 three techniques coupled with some kind of grid drilling
30 on site. Is that a fair way of setting up the kinds of

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Goudge

1 analyses of borrow deposits that can be done?

2 A That's correct. What
3 do you mean exactly by "grid drilling" on sites. This
4 is the -- there's a grid --

5 Q Drilling at intervals
6 on a regular pattern --

7 A There are two different
8 kinds of investigation you can do as was done at Yaya
9 where there were many, many drill holes. You can do
10 one or two drill holes and test pits on a deposit. There
11 are different levels of that sort of thing.

12 Q Yes. Yes.

13 A Now which are you referring
14 to?

15 Q Well, let me simply
16 categorize that as a drilling investigation but that is
17 whether you take the spot drilling or the detailed
18 grid drilling. The most intensive investigation you
19 can get in analyzing borrow material capacities. Would
20 you agree with that?

21 A That's correct.

22 Q Now, I'm interested in
23 getting from you the detail of investigation that has --
24 that is available regarding the deposits shown on your
25 three maps. Would you be able to tell me for example
26 what percentage of the deposits shown on your three
27 maps have been subject to any kind of drilling explora-
28 tion or drilling investigation?

29 A The map on the west
30 side of the delta has drilling and testing in 29 of 33

Cooper, Hollingshead, Williams,
~~Manning~~, Clark, Purcell,
Cross-Exam by Goudge

1 deposits that are -- have been investigated on the
2 west side of the delta.

3 Q What about the east side?
4 Can you give me that or do you know?

5 A I don't have the totals
6 for that side yet. We're still working on that report.

7 Q Yes. That information
8 would be in your report, I take it?

9 A That's correct.

10 Q Yes. Would you agree in
11 general terms that as you go from the more general
12 analysis of borrow deposits, that is aerial photography
13 technique at the extreme end to the more specific
14 technique -- that is, the grid drilling -- the reserve
15 estimates for available borrow generally decline?

16 A Yes.

17 Q In some cases decline
18 very markedly ?

19 A Yes.

20 Q Let me put one example
21 to you which seemed to me to make the lesson graphic.
22 It relates to borrow pit 107-C-B2. Dr. Mollard, as I
23 understand it, using aerial photography came up with
24 an estimate of 1 million, 500 thousand cubic yards and
25 Ripley, Klohn, Leonoff, after field investigation reduced
26 that to 400 thousand cubic yards. Is that an accurate
27 account of --

28 A That sort of thing can
29 happen, yes.

30 Q Yes. So that to get a

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell,
Cross-Exam by Goudge

1 realistic picture of the availability of granular
2 materials, a detailed drilling program is necessary
3 if one is going to avoid over-optimism.

4 A Definitely.

5 Q In arriving at granular
6 material supply data, are you -- is there any proposal
7 to conduct more intensive drilling exploration of the
8 gravel deposits you have shown on your three maps?

9 A Yes. When the final
10 design of a compressor site or the major use site
11 takes place, then an investigation of the deposit
12 that's been chosen there will also take place and
13 perhaps if the deposit shows that it isn't what it
14 had thought to have been in the first place, it will
15 be changed.

16 Q Yes. In fact, I take
17 it the practice to be before you can get a quarry
18 permit, there has to be a very detailed drilling program
19 undertaken in the proposed area so that --

20 A That's correct.

21 Q -- there will be an
22 accurate estimate of the reserves in the area.

23 A That's correct. We have
24 spoken before to this matter and have said that we
25 planned to do this as we developed the different sites
26 along the route.

27 Q Yes. Now, given that
28 you're going to this and given that the rule of thumb
29 exists that the picture is rosier at the beginning if
30 I can put it that way, do your supply estimates discount

1 for the state at which your investigations
2 are at now? Or should we in some sense discount them to
3 take account of reductions which further drilling may
4 show?

5 A Most of the deposits
6 that were chosen, show even when you decrease the
7 numbers as have been done by the consultants that
8 followed the original look at the deposits, they^{still} have
9 plenty. Most of them still have plenty. Even, for
10 example, Yaya. It has, a conservative estimate, is
11 9 million cubic yards at Yaya. A more -- another end
12 of even the consultants' estimates is 17 million. So
13 even when you^{have} a very detailed study like you have at
14 Yaya, there is still some question. But there's still
15 quite a bit of material at Yaya. Many of our deposits
16 will probably be like that. There will be some that
17 will not have as much material. But that's a --
18 that's a site specific thing, to say that is true of
19 every deposit is very hard to say.

20 Q Now let me come to the
21 matter of competing uses. Dealing specifically with
22 the cross-delta proposal from Milepost 319 to Tununuk
23 Junction, it's fair to say that the competing use
24 problem for granular materials exists on the east side
25 rather more than the west side.
26
27
28
29
30

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

1 A At this point, yes.

2 Q Your work would indicate
3 that there is a fairly large number of granular deposits
4 on the west side and no contemplated present competing
5 use?

6 A That's correct.

7 Q Whereas on the east side
8 the competing uses are very numerous or at least are
9 numerous.

10 A We are told they are, yes.

11 Q Your proposal draws
12 on the Yaya pits to the extent of some 1,800,000 cubic
13 yards.

14 A That is correct.

15 Q And given that there is
16 perhaps a conservative but nonetheless I think
17 generally accepted figure of 9 million cubic yards
18 there now. I wonder if you could give me your opinion
19 as to how much of that 9 million cubic yards is presently
20 committed to uses other than Canadian Arctic Gas. Do
21 you have any idea of that?

22 A It depends on who you
23 read or who you talk to now. I'm sure that the
24 government witness had much more information than we
25 have as to the competing uses in this area. This is
26 Mr. Inglis and he testified to quite large numbers of
27 granular materials to be used by other people from
28 that particular deposit. Our information is that the
29 companies need approximately 3 million cubic yards from
this deposit at present.

Cooper, Hollingshead, Williams:
Minning, Clark, Purcell
Cross-Exam by Goudge

Q That's 1 million or a minimum of 1 million for Shell and 2 million for Imperial.

A That's correct.

Q Do you have any information as to the prospective use of the Yaya pits by, for example, the Town of Inuvik?

A No.

Q There is no doubt though that the circum-delta route didn't draw on the Yaya pit at all.

A I think there was some use of that as I remember from the original strip maps. I could be wrong.

Q Certainly nothing like the 1 million --

A No, nothing like the present.

Q Now, let me ask you whether in your view, it would be possible to obtain all the necessary gravel for the cross-delta route from the west side of Shallow Bay.

A Oh, there is lots of gravel over there, yes.

Q And in your view, I take it, it would be possible subject only to cost.

A Sure.

Q And that might well involve the barging of gravel from Shingle Point?

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

1 A Yes, Shingle Point is one
2 area where there is significant gravel available.

3 Q There is no difficulty
4 with the quality of gravel on the west side of the
5 delta as far as your needs are concerned?

6 A Some of the gravel on the
7 west side of the delta has a fair amount of ice which
8 may affect its development and use.

9 Q But you still have no
10 difficulty with saying there is both a sufficient
11 quality and a sufficient quantity of gravel on the
12 west side of the delta to meet your needs should Yaya
13 be ignored?

14 A Yes.

15 Q Finally, Miss Minning,
16 just for my own education, you refer at page 19768 of
17 the transcript to half, I think, of the material
18 being drawn from Yaya being of a class 2 or less
19 quality. Is that correct?

20 A That's correct.

21 Q What do you mean by that?
22 Can you tell me what class 2 is? Or class 1?

23 A These are the DIAND
24 granular classes.

25 Q Just so we'll have it,
26 how are they distinguished?

27 A I would like to look at
28 their original description of these classes and read it
29 to you exactly if that's possible. I don't have that
30 here right now.

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

1
2 Q It would be useful to
3 clarify your evidence if you could just photocopy it
4 and ship it along through Mr. Marshall. Do you know
5 whether it is possible --

6 MR. MARSHALL: I believe Dr.
7 Fyles could supply that. He probably wrote it. If
8 that's all you are interested in, is having a description.

9 MR. GOUDGE: We just wanted --
10 I wanted to understand the transcript.

11 MR. MARSHALL: I was just
12 thinking of the best evidence rule.

13 MR. GOUDGE: Mr. Marshall, you
14 are getting very lazy. Let me ask you this, Miss
15 Minning. Do you know whether it is possible to change
16 class 2 into class 1 granular material through processing?

17 A It depends on which end
18 of class 2 you are at.

19 Q Poorer class 2 material
20 could not be processed but good class 2 material could
21 be processed into class 1 material?

22 A Probably.

23 Q Half of the material, as
24 you say, of the, from Yaya must be in your view of a
25 class 1 nature. Why is there that requirement for the
26 best quality granular material? Perhaps, Mr. Williams,
27 you can tell us to what use it is being put and why
28 it is needed in that quantity?

29 WITNESS WILLIAMS: A This
30 is the top layer of the work pads that are required in

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

1 the delta, Mr. Goudge, that meets as material that is
2 not going to erode badly during spring floods and the
3 possibility of summer seasonal floods.

4 Q So it is the exteriors of
5 your granular pads that you are referring to as
6 requiring class 1 material.

7 A Yes, in these quantities that
8 we're talking about that are shown on the strip maps
9 that just reiterate that the quantities shown on the
10 strip maps don't show the miscellaneous materials that
11 may be required bedding, padding and concrete weighting
12 and so forth.

13 Q Now, Mr. Williams, relating
14 to the Parsons Lake lateral which is as well before us,
15 I think your maps reveal that the junction of that
16 lateral has been moved south $11\frac{1}{2}$ miles.

17 A Yes, sir.

18 Q And that is because Gulf
19 has moved its processing plant?

20 A It is to fit the location
21 of the plant that has been given to us by Gulf, yes.

22 Q And previously, as I
23 understand it, compressor station MD01 was at the
24 junction of the lateral and the main line?

25 A I think that is correct.

26 Q And I wonder if any
27 contemplation has been given to moving that compressor
28 station to the new junction of the lateral and the main
29 line?

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

1 WITNESS PURCELL: A There
2 is no reason for it to be at the junction. There is
3 no necessity. The fact that is now downstream means
4 that the supply pressure at the plant has to be
5 higher because it is going into the pipeline at a
6 higher pressure, but it is about the same distance from
7 the plant to the main line as it is from the upstream
8 compressor station to the junction of the lateral --

9 Q So there is no pressure
10 advantage --

11 A So there is equivalent
12 pressure dropped down the lateral and down the main
13 line and the operation is feasible.

14 Q Yes and Mr. Purcell then
15 from your point of view, there is no plan afoot to
16 change that location?

17 A Certainly not for that
18 purpose.

19 Q Now, Mr. Williams,
20 dealing with the other supply lateral, the Niglintgak
21 supply lateral, I take it your proposal is that that
22 will be constructed by separate crew from the crew
23 constructing the main line?

24 WITNESS WILLIAMS: A Yes,
25 sir.

26 Q And I take it that's
27 because you need a different size trench, among other
28 things.

29 A Different size trench,
30 different size pipes and different size -- you can get

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

1 by with smaller equipment to handle the smaller pipe.

2
3 Q Yes and will you require
4 the same of that contractor, regarding weighting through-
5 out as you require for your main crossing of the delta?

6 A I would suspect most of
7 it, Mr. Goudge.

8 Q Because it is in the modern
9 delta in its entirety wouldn't you have to coat it
10 with concrete just as you plan to coat your cross-delta
11 portion in concrete?

12 A I would suspect so. This
13 addition has come up fairly recently, Mr. Goudge, and
14 we haven't been able to get out there in the summertime
15 to have a proper look at it. I suspect you are right
16 except that I would like to say again that the cost
17 estimates reflect concrete coating that is not
18 necessarily what would be done.

19 Q Yes, and there is --
20 sorry.

21 A The alternatives again
22 are frost anchoring and ditch flooding.

23 Q There is, I think, one
24 crossing on that lateral which may be a little out of the
25 ordinary and that is the Kumak Channel crossing. Have
26 you given any attention to that crossing?

27 A We have -- I'm sorry.
28 Dr. Hollingshead --

29 WITNESS HOLLINGSHEAD: A I'm
30 sorry.

Cooper, Hollingshead, Williams
Minning, Clark, Purcell
Cross-Exam by Goudge

Q Is this going to be
done in the summer, Dr. Hollingshead?

A I expect following the
criteria that have been set out to this point, it would
be very likely summer construction.

Q It is a major crossing
to go with the others we have talked about all week?

A Yes, sir.

Q And will it be twinned?

A I rather doubt it although
that is a possibility. There isn't -- if this line
went out of service, I don't think that the penalty
is quite as severe as some other parts of the system.

Q Now, one problem that
arises is that this line is in the bird sanctuary in
its entirety, is that not so, Mr. Williams?

WITNESS WILLIAMS: A I
think that's correct.

Q And does that present
a problem insofar as summer activity is concerned?

A I would suspect so, yes.

Q If that is a problem, Dr.
Hollingshead, would you be able to construct a Kumak
crossing in the winter?

Cooper, Hollingshead, Williams,
Manning, Clark, Purcell
Cross-Exam by Goudge

1 WITNESS HOLLINGSHEAD: If you'll
2 bear with us for a moment.

3 WITNESS WILLIAMS: There's
4 one I would not want to do in the winter, Mr. Goudge,
5 for the same reason we gave before. It has a substantial
6 depth and width.

7 THE COMMISSIONER: Safety,
8 is the principle reason?

9 A That is my main concern
10 sir, yes.

11 THE COMMISSIONER: Do you want
12 to add something?

13 WITNESS HOLLINGSHEAD: Well
14 I was just going to say that a cross-section very near
15 the crossing there indicates the channel is in the order
16 of 2,000 feet wide and about 10 feet deep.

17 MR. GOUDGE:

18 Q And I take it Mr. Williams
19 you've not resolved the problem presented by summer building
20 insofar as the bird sanctuary is concerned?

21 WITNESS WILLIAMS: No sir,
22 we have not.

23 Q And have you given any
24 attention to the fact that when the line is installed,
25 maintenance of the line will have to take place in
26 the sanctuary as well. Are there any special techniques
27 that you would adopt because of that?

28 A Oh again, if it's
29 maintenance of the backfill, due to subsidance, that
30 can be done, at least on the land section, in the
31 wintertime. The same plan would apply there as

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell
Cross-Exam by Goudge

1 elsewhere, that every effort would be made to stay
2 out of the area during winter, I'm sorry, during summer.

3 Q With the additional
4 reason that it's a bird sanctuary, and therefore even
5 more risky to transgress in the summertime?

6 A Yes. And the terrain
7 problem.

8 Q Now Mr. Williams, finally
9 let me ask one question that arises out of the
10 consolidation filing. As I understood your original
11 application, the right of way clearing was to be done
12 in the winter by machine. That was what the application
13 said, and then in your evidence I think you indicated
14 your preference in the north and in sensitive areas
15 for handclearing in the summer.

16 A That latter statement
17 is certainly correct. I don't know if the original
18 application was that firm on winter machine clearing,
19 Mr. Goudge. Wasn't there some discussion there of an
20 alternative?

21 Q Yes, I think there may
22 well have been, and you and I got into an discussion
23 of some type blades and other things.

24 A Yes sir.

25 Q There's no doubt now that
26 your proposal is for hand clearing in the summer in
27 sensitive areas in the northern part of the line north
28 of 60.

29 A That is my preference
30 and would be my recommendation.

Cooper, Hollingshead, Williams,
Gunning, Clark, Purcell
Cross-Exam by Goudge

1 Q And in fact, everywhere
2 north, slightly south of Fort Norman falls into that
3 category.

4 A Yes sir.

5 Q So that half the spreads
6 north of 60 will be operating with clearing done by
7 this technique, spreads A, B. and C, which are the
8 northern three spreads.

9 A Yes.

10 Q Given this technique,
11 Mr. Williams, I'm interested in knowing whether you
12 plan to have any machinery at work doing the clearing
13 on the right of way in the summer?

14 A No.

15 Q So that the men will be
16 transported to the right of way by helicopter only.

17 A Yes.

18 Q And piling and stacking
19 of timber will be done by hand?

20 A Yes.

21 Q And there'll be no
22 burning sleds towed along the right of way in the
23 summer?

24 A No.

25 Q What about the burning
26 of the brush? Do you propose doing that in the summer,
27 or waiting until winter?

28 A Waiting until winter.

29 MR. GOUDGE:
I think sir, that completes
30 my cross-examination of this panel.

Cooper, Hollingshead, Williams,
Minning, Clark, Purcell

MR. MARSHALL: No re-examination, sir.

1 THE COMMISSIONER: Well, that
2 completes the evidence of this panel, and I want to
3 thank all of you, Miss Minning and gentlemen, for
4 your appearing and your co-operation with counsel and
5 with the Inquiry, and you're excused. The Inquiry
6 will adjourn until Tuesday of next week at 2:00 P.M.
7 Next week we'll sit Tuesday, Wednesday, Thursday and
8 Friday, and then we will adjourn until Monday, April
9 5. And I should say that the week after that, we will
10 not sit April 12, but will sit Tuesday, April 13.

11 MR. MARSHALL: What time?

12 THE COMMISSIONER: Well,
13 Mr. Goudge suggested we begin at 10:00 A.M. that day.
14 That would mean everyone coming up the day before. If
15 you object to that, let's discuss it next week. And
16 as I understand it, Arctic Gas will present it's
17 environmental panel on the cross-delta route next
18 week, and we'll hear further evidence to be called
19 by Commission counsel next week, and sometime in the
20 week of April 5, we should begin phase 4, so there we
21 are.

22 (PROCEEDINGS ADJOURNED)
23
24
25
26
27
28
29
30

347
M835
vol.132

AUTHOR

Canada.National Energy Board
Mackenzie Valley Pipeline-
Inquiry

DATE DUE

BORROWER'S

347
M835
vol.132

CA1
Z 1
-74M21

MACKENZIE VALLEY PIPELINE INQUIRY

Government
Publications

IN THE MATTER OF APPLICATIONS BY EACH OF

(a) CANADIAN ARCTIC GAS PIPELINE LIMITED FOR A
RIGHT-OF-WAY THAT MIGHT BE GRANTED ACROSS
CROWN LANDS WITHIN THE YUKON TERRITORY AND
THE NORTHWEST TERRITORIES, and

(b) FOOTHILLS PIPE LINES LTD. FOR A RIGHT-OF-WAY
THAT MIGHT BE GRANTED ACROSS CROWN LANDS
WITHIN THE NORTHWEST TERRITORIES.

FOR THE PURPOSE OF A PROPOSED MACKENZIE VALLEY PIPELINE

and

IN THE MATTER OF THE SOCIAL, ENVIRONMENTAL AND
ECONOMIC IMPACT REGIONALLY OF THE CONSTRUCTION,
OPERATION AND SUBSEQUENT ABANDONMENT OF THE ABOVE
PROPOSED PIPELINE.

(Before the Honourable Mr. Justice Berger, Commissioner)

Yellowknife, N.W.T.

March 23, 1976.

PROCEEDINGS AT INQUIRY

Volume 133

CANADIAN ARCTIC
GAS STUDY LTD.

MAR 29 1976

LIBRARY

344
H835
Vol. 133

APPEARANCES:

Mr. Ian G. Scott, Q.C.,
Mr. Stephen T. Goudge,
Mr. Alick Ryder and
Mr. Ian Roland for Mackenzie Valley Pipeline
Inquiry;

Mr. Pierre Genest, Q.C.,
Mr. Jack Marshall, and
Mr. Darryl Carter for Canadian Arctic Gas
Pipeline Limited;
Mr. Reginald Gibbs, Q.C.,
Mr. Alan Hollingworth &
Mr. John W. Lutes, for Foothills Pipe Lines Ltd.;

Mr. Russell Anthony &
Pro. Alastair Lucas for Canadian Arctic Resources
Mr. Garth Evans Committee;

Mr. Glen W. Bell and
Mr. Gerry Sutton, for Northwest Territories
Indian Brotherhood, and
Metis Association of the
Northwest Territories;

Mr. John Bayly
or
Miss Leslie Lane for Inuit Tapirisat of Canada,
and The Committee for
Original Peoples Entitle-
ment;

Mr. Ron Veale and
Mr. Allen Lueck for The Council for the Yukon
Indians;

Mr. Carson H. Templeton, for Environment Protection
Board;

Mr. David Reesor for Northwest Territories
Association of Municipal-
ities;

Mr. Murray Sigler for Northwest Territories
Chamber of Commerce.

Mr. John Ballem, Q.C., for Producer Companies;

344
11635
101.133

	<u>I N D E X</u>	<u>Page</u>
1		
2	WITNESSES FOR CANADIAN ARCTIC GAS PIPELINE LIMITED:	
3	Robert WEBB	
4	Donald DABBS	
5	W.W.H. GUNN	
6	Peter J. McCART	
7	Ronald JAKIMCHUK	
8	Doug ROWE	
9	- In Chief	20121
10	- Cross-Examination by Mr. Bayly	20165
11		
12		
13		
14	EXHIBITS:	
15	498 Letter from Dr. Bliss, March 2/76	20115
16	499 Letter from B. Yates to J. Bayly, March 11, 1976	20116
17	500 List of Reports by Canadian Arctic Gas	20119
18	501 Report: N.E.S. The Vegetation of the Mackenzie Delta Area, December , 1975	20120
19	502 University of Saskatchewan "Waste Heat Recovery Greenhouse Vegetable Production Project", 1975	20141
20	503 Report, L.S.L. Limited, Ornithological Studies, Cross-Delta Route, January 1976	20141
21	504 Fisheries Investigations of Mackenzie Delta in Vicinity of Cross-Delta Alternative	20142
22	505 Report, N.E.S. Progress Report on Rig Site Seeding Tests in Mackenzie Delta, Mar./76	20142
23	506 Recommendations to N.E.S. & Canadian Arctic Gas Study Limited from Aquatic Environments	20142
24	507 Written material of Dr. P. Brodie	20159
25	508 Map Fig. 1, Snow Geese Distribution 1975	20179
26	509 Map Fig. 4, Other Geese & Whistling Swans Distribution 1975	20179
27		
28		
29		
30		

Yellowknife, N.W.T.

March 23, 1976.

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

THE COMMISSIONER: Mr. Bell?

MR. MARSHALL: I think we're missing one of the panelists, sir, but I have some preliminary matters I could deal with.

MR. BELL: Mr. Commissioner, I'm informed by a source close to the Inquiry, as our friends in the media say, that today is your birthday, and I thought perhaps it would be a good opportunity to wish you many happy returns. We didn't get a chance to do it last year and we may not get a chance to do it next year.

(LAUGHTER)

THE COMMISSIONER: Thank you, Mr. Bell.

(APPLAUSE)

MR. SCOTT: Mr. Commissioner, for your birthday we had attempted to arrange a special program and I was making efforts to arrange a special panel on frost heave, which I thought you would find interesting, but unfortunately it was not possible on such short notice to have it here. So we'll have to do with the panel that you see before you today.

THE COMMISSIONER: Failing a panel on frost heave, couldn't you have arranged one on crack arresters?

Well, just to show that the public has a complete understanding of what the work

1 of this Inquiry is,^I should tell you I received a letter
2 today from a young man who says:

3 "I am interested in being involved on a seal
4 or bear hunt in some area surrounding the more
5 remote settlements and would like to co-ordinate
6 my visit with a hearing of your Inquiry."

7 So he wants the agenda of the Inquiry. You can't please
8 everyone, I guess.

9 MR. SCOTT: Mr. Commissioner,
10 there are a number of preliminary matters that perhaps
11 should be dealt with. When Dr. Bliss appeared on a
12 panel with the Environmental Protection Board, he
13 indicated that he would write to the Inquiry if he
14 had other views about steps that might be taken to
15 test and assess impacts. He has written to me by letter
16 dated March 2nd, 1976, and I would ask that his letter
17 should be an exhibit. It's quite long and I don't think
18 it's necessary to read it into the record. It will,
19 of course, be available for all counsel to read and
20 absorb. So I would ask that that be the next exhibit.

21 (LETTER FROM DR. BLISS DATED MARCH 2, 1976

22 MARKED EXHIBIT 498)

23 MR. SCOTT: The next matter
24 is that when Mr. Barry Yates of the Department of
25 Indian & Northern Affairs gave evidence at Inuvik,
26 Mr. Bayly and he had a conversation about a letter
27 from Imperial Oil Limited relating to the Campbell
28 Lake quarrying site, and as a result of a matter that
29 was raised in evidence and subsequently, I gather, in
30 the corridor, Mr. Yates has written to Mr. Bayly

1 attaching a statement and some supporting documents.
2 The letter to Mr. Bayly simply says:

3 "Dear Mr. Bayly:

4 When I was testifying before the Berger Inquiry
5 on February 12th, you asked me to comment on
6 Imperial Oil Limited's letter of December 9,
7 1975 relating to the Campbell Lake quarrying
8 site. At that time recess was called and the
9 subject did not come up again during the course
10 of my testimony. Afterwards we spoke and I
11 said I would send you written comments.

12 I am attaching my comments and the application
13 as requested. I have also sent a copy of this
14 letter and the comments to Stephen Goudge so
15 that he may have the material distributed.

16 Yours sincerely,"

17 I think that should be, with Mr. Bayly's permission,
18 the next exhibit.

19 (LETTER FROM B. YATES TO J. BAYLY DATED
20 MARCH 11, 1976 MARKED EXHIBIT 499)

21 MR. BAYLY: I have no objection,
22 Mr. Commissioner.

23 MR. SCOTT: The third matter,
24 Mr. Commissioner, that remains outstanding relates to
25 evidence that Mr. Bayly proposed to call at Inuvik,
26 composed of a panel of Mr. Usher and a number of
27 others, and evidence that he proposed to call, I think
28 at the same time relating to the "Mizushima" oil spill.
29 It was not possible to proceed with that evidence at
30 Inuvik and it was in effect withdrawn, it being

1 understood that if Mr. Bayly wanted to proceed with
2 the matter he would notify us before Phase 4 began.
3 It was his view that that evidence should be called
4 prior to Phase 4. He has now formally notified us that
5 he wishes to call that evidence and it seems to me that
6 if any participant objects to that evidence being
7 called, he should so signify so that we can deal with
8 the issue, as to whether it is admissible before the
9 Inquiry.

10 Now I understand that Mr.
11 Marshall may object to it, and if he does, perhaps he
12 could suggest a time and place and he can make his
13 objections known.

14 THE COMMISSIONER: Well, I under-
15 stand that you're having a meeting of counsel tonight.
16 Maybe I could leave it to you gentlemen to decide when
17 you want to argue the point. It may be that in the
18 course of your meeting you will be able to resolve the
19 question satisfactorily to Mr. Bayly or to Mr. Marshall.

20 MR. MARSHALL: Being your
21 birthday today, sir, I think it would be best if we
22 were to leave this sort of matter for another occasion.
23 I think we may be able to get it resolved tonight at a
24 meeting of counsel.

25 MR. SCOTT: I'd be prepared to
26 try to do that, Mr. Commissioner. The only rider I have
27 is that I would like to have the question of whether that
28 evidence is going to be led, decided this week. Otherwise
29 it will not be possible to lead it before the stated
30 commencement date for Phase 4.

1 THE COMMISSIONER: Well,
2 the schedule, if you can't resolve it tonight,
3 schedule a time to argue it tomorrow. It shouldn't
4 take longer than half an hour to do that.

5 MR. SCOTT: Yes.

6 MR BAYLY: Mr. Commissioner,
7 I have just distributed the evidence that we would
8 intend to call through Mr. Nicol on the "Mizushima"
9 oil spill and I know Mr. Scott wants to get these
10 matters disposed of, but in fairness, if anybody is
11 going to assess this evidence and object to it, I
12 would think it might be difficult for them to so by
13 tomorrow.

14 THE COMMISSIONER: Well, I'll
15 leave that with you people and you can let me know
16 tomorrow what you want to do about it.

17 MR. SCOTT: I also wonder
18 sir, if Mr. Marshall could formally advise the Inquiry
19 when he anticipates that the evidence respecting oil
20 spill contingency plans will be available. It has
21 been for all of us, a bearable difficulty not to have
22 that material when this panel and the previous one
23 have been examined, but it would be good to know when
24 we may anticipate that that evidence will be at hand.

25 MR. MARSHALL: As I indicated
26 to you prior to commencement of proceedings, Mr. Scott,
27 my information is that Arctic Gas has a report dealing
28 with contingency planning in preparation. It's hoped
29 that it'll be available within one or two weeks. When
30 Mr. Hemstock's here later in the week, I could perhaps

1 give you some more definite information. I can't now.

2 MR. SCOTT: Those are the
3 only matters I had.

4 MR. MARSHALL: Sir, we have
5 the environmental panel to deal with the cross-delta
6 before you today. Unfortunately, Mr. Hemstock and
7 Dr. Banfield can't join the panel till in the week. I
8 asked Doug Rowe if he could read in Mr. Hemstock's
9 evidence. I'd thought we'd leave Dr. Banfield's evi-
10 dence until he arrives. Mr. Rowe and the other members
11 of the panel, Mr. Dabbs, Dr. Gunn, Mr. Jakimchuk, Dr.
12 McCart, Mr. Webb; have all previously been sworn.

13 Before they commence to read
14 in their direct evidence sir, I ought to file some
15 items. First is a list of reports that was appended
16 to Mr. Hemstock's testimony on behalf of the panel.
17 The second is a set of color prints that were used by
18 Mr. Dabbs during his presentation in phase two of the
19 Inquiry, November 1975, keyed to the transcript.

20 The next is a report entitled,
21 "The Vegetation of the Mackenzie Delta Area", by
22 Northern Engineering Services dated December, 1975.
23 This was previously circulated.

24 Next is a report to Canadian
25 Arctic Gas Study Limited on "1975 Activities of the
26 Waste Heat Recovery, Greenhouse Vegetable Production
27 Project", from the University of Saskatchewan dated
28 February, 1976.

29 (LIST OF REPORTS BY CANADIAN ARCTIC GAS, MARKED
30 AS EXHIBIT #500)

1 (REPORT: N.E.S. THE VEGETATION OF THE MACKENZIE
 2 DELTA AREA -- D. REID & G.M. CALDER; DECEMBER,
 3 1975 MARKED AS EXHIBIT 501)

4 I air-expressed a copy of
 5 this to Mr. Scott knowing of his keen interest in the
 6 work that was going on.

7 The next is a study of L.G.L.
 8 Limited dated January 1976 entitled "The Supplement to
 9 Ornithological Studies on the Cross-Delta Route". This
 10 has previously been distributed and the main study
 11 has been filed as an exhibit.

12 Next a report of Aquatic
 13 Environments Limited entitled, "Fisheries Investigations
 14 of the Mackenzie Delta in the Vicinity of the Cross-
 15 Delta Alternative Pipeline Route; Preliminary Report".
 16 This report was circulated in December when it came out.

17 As well, the report of Northern
 18 Engineering Services on "Progress Report on Rig Site
 19 Seating Tests in the Mackenzie Delta Region, Northwest
 20 Territories", date March, 1976.

21 I believe all the participants
 22 have that document. There is an errata and I have
 23 copies of the pages that are to be replaced.

24 Finally, for now at least,
 25 a document entitled "Recommendations From Aquatic
 26 Environments Limited" dated the 22nd of March, 1976.
 27 which has just now been distributed. We had undertaken
 28 to file as well the report of renewable resources which
 29 would be a set of the recommendations. I'm advised by
 30 Mr. Jakimchuk that that document is in the final stages

Webb, Dabbs, Gunn, McCart
Jakimchuk, Rowe
In Chief

1 of preparation and he's hopeful that it will be completed
2 tomorrow so that it can be distributed.

3 I believe sir, the other
4 reports that this panel relies on have been filed
5 earlier as exhibits.

6 Sir, I'd like to start with
7 the evidence of Mr. Hemstock which I've asked Mr. Rowe
8 to read into the record. In the case of this evidence,
9 there are some minor changes that were not picked up
10 in the letter that I sent to counsel previously that
11 set out the major changes that were necessary in the
12 evidence in order to deal with matters set out in the
13 letter of March 16.

14 I've asked Mr. Rowe and the
15 other witnesses to indicate when they come to a point
16 in the prepared evidence, where the evidence will depart
17 from that previously circulated.

18 ROBERT WEBB,
19 DONALD DABBS,
20 W. W. H. GUNN,
21 PETER J. MCCART,
RONALD JAKIMCHUK,
DOUG ROWE, resumed;

22 DIRECT EXAMINATION BY MR. MARSHALL:

23 Q Mr. Rowe, perhaps --

24 THE COMMISSIONER: Excuse me,
25 I don't have this. Is this written out?

26 MR. MARSHALL: Yes sir. I
27 guess I always operate under the wrong assumption that
28 Commission Counsel provides you with these. We have an
29 extra set though sir.

30 MR. SCOTT: It's sometimes

1 | difficult when it gets here late.

MR. SCOTT: Mr. Commissioner,
I wonder if Mr. Rowe mightn't also be asked to read Dr. Banfield's evidence. It's part of the evidence of this panel and it seems to me that some members of the panel might be asked about it and bearing in mind that they are intending at the end of the week to be cross-examined it seems to me that it would be useful to have Dr. Banfield's transcribed evidence before you as the panel gives the balance of its evidence.

14 MR. MARSHALL: Well sir I'm
15 a bit reluctant to do that, though I don't really have
16 a strong position on it. I'm learning from experience
17 in these matters. I thought that as Mr. Rowe works for
18 Mr. Hemstock directly, it would be appropriate to have
19 him read in Mr. Hemstock's evidence. Dr. Banfield, is,
20 of course, quite an independent consultant and I'm
21 happy to have Mr. Rowe read that in as well, but as
22 I say, I've got some reservations about whether it
23 would be appropriate to do that.

Webb, Dabbs, Gunn, McCant,
Jakinchuk, Rowe
In Chief

1 MR. SCOTT: Well, the reason
2 Mr. Commissioner is that it seems to me that it will
3 be -- or it may be desirable to ask those of particular
4 disciplines on the panel whether they agree with some
5 of the things Dr. Banfield has said in his transcription,
6 or if they note any omissions, or have any comments
7 on the direct and sometimes colorful way he has expressed
8 the problem; and it would be hard to do that if that
9 material hadn't been heard, and wasn't part of the
10 transcript.

11 MR. MARSHALL: Well sir, the
12 other problem is that there have been a number of changes
13 that have occurred that are set out in the letters I
14 filed as exhibits the last session. Dr. Banfield's
15 evidence doesn't reflect those. Now I don't know
16 whether he would want to change his evidence when he
17 presented it in order to take those matters into account
18 or not. He's still -- he's in Scotland, or has been
19 in Scotland until today, and I haven't spoken to him
20 about it, so I don't know whether or not he wants to
21 ammend his evidence or he doesn't.

22 MR. SCOTT: Well don't I
23 understand that he's in Washington with Mr. Hemstock
24 today, Mr. Marshall?

25 MR. MARSHALL: As far as I
26 know.

27 MR. SCOTT: Well, the difficulty
28 Mr. Commissioner is that we've been provided with a
29 transcript, no doubt prepared by Dr. Banfield, under
30 the new regime, of what he proposed to say, and it seems

Webb, Dabbs, Gunn, McCant,
Jakimchuk, Rowe
In Chief

1 to me that it is important to ask the other panel
2 members, who have precise expertise in some of the
3 areas that he's discussed, what they have to say about
4 his conclusions and his views. Now, if he wants to,
5 on Friday, qualify what he has said, or withdraw what
6 he has said in any fashion, of course he's perfectly at
7 liberty to do that.

8 THE COMMISSIONER: All right.
9 Well, I think what we'll do is this. Mr. Rowe will
10 read Mr. Hemstock's evidence, and when we come to
11 Mr. Banfield's evidence, we'll ask Mr. Rowe to read
12 it, on the footing that it's not to be regarded as
13 Mr. -- Dr. Banfield's last word, but simply the views
14 he has supplied Arctic Gas with, and if he decides to
15 amend them when he comes, that can be done without
16 prejudice. I'm sure no one would try to make anything
17 out of it.

18 MR. MARSHALL: That's quite
19 satisfactory to me sir.

20 THE COMMISSIONER: And, Mr.
21 Rowe is wearing a tie today, and we haven't ever seen
22 him before with a tie, and think that he reads well, and
23 I think he should be given a chance to read both of
24 these.

25 MR. HOLLINGWORTH: When you
26 include Dr. McCart's tie it is really quite a day indeed

27 MR. MARSHALL: If we could have
28 Miss Allison in a skirt. Sir, I don't believe that Mr.
29 Rowe has had an occasion to present his curriculum vitae.
30 Perhaps I could just run through a couple of questions

Webb, Dabbs, Gunn, McCant,
Jakimchuk, Rowe
In Chief

1 with him so as to more formally introduce him. Mr.
2 Rowe, what is your position with Canadian Arctic Gas?

3 WITNESS ROWE: I am an
4 environmental co-ordinator, working for Alex Hemstock.

5 Q And, what are your
6 responsibilities in your position?

7 A My responsibilities are
8 primarily in the design of the budgetary process for
9 Arctic Gas; the monitoring of the field programs from
10 that point of view; the liasion with the engineering
11 department, to ensure that the environmental stipulations
12 and regulations as developed by the consultants and
13 Northern Engineering are incorporated into the engineering
14 design.

15 Q Mr. Rowe, I understand
16 you have an engineering degree from Queens University?

17 A That is correct.

18 Q In what year?

19 A I'm sorry?

20 Q In what year?

21 A 1966.

22 Q And could you just outline
23 briefly your professional experience since graduation?

24 A Surely. After graduation
25 in 1966 I joined TransCanada Pipelines, and I was first
26 employed in the engineering construction department of
27 TransCanada .. My initial capacity was as a field
28 construction inspector, construction supervisor, welding
29 inspector, and so on. I worked both on compressor
30 station construction, as well as mainline pipeline

Webb, Dabbs, Gunn, McCant,
Jakimchuk, Rowe
In Chief

1 construction. Subsequent to that, I was assigned to
2 the quality control department of TransCanada , and
3 worked for several years there in field testing operations
4 of pipeline installations; performance testing of
5 compressor station turbine equipment, and so on; and
6 in 1970, I was assigned to Canadian Arctic Gas, on
7 leave from TransCanada Pipelines, working for Lee Hurd,
8 at the time. My areas of responsibility in the Northwest
9 Project Study Group, as it was called at that time,
10 were in the engineering field, primarily on the initial
11 design and implementation of the environmental program;
12 the Nortran Training Program; and then in the last few
13 years working with Mr. Hemstock in the environmental
14 area.

Webb, Dabbs, Gunn, McCart
Jakimchuk, Rowe
In Chief

Q Thank you, Mr. Rowe.

Could you proceed now to read into the record Mr. Hemstock's evidence on the cross-delta environmental assessment?

A

"The preliminary environmental and engineering route selection did not consider a delta crossing because at the time it was considered that there might be both engineering and environmental problems which would be difficult to surmount in crossing the Mackenzie Delta. However, in October, 1973, I raised with the Director of Engineering, the possibility of crossing the delta in order to shorten the overall pipeline mileage, and thereby lessen potential environmental impact. Although we had no site specific studies of the proposed routing in the area at that time, I knew that there were some portions of the delta which were not particularly important habitat, due to seasonal flooding and to the extremes of the climate. I reasoned that it might be possible to build a pipeline in those areas with less environmental impact than would occur by the route proposed around the delta.

Accordingly, we commissioned preliminary studies to determine if an acceptable route could be selected and to identify the potential problems from both an engineering and environmental standpoint.

We could see little difference

Webb, Dabbs, Gunn, McCart
Jakimchuk, Rowe
in Chief

1 between the two routes from the standpoint of
2 impact on northern people. It appeared to us
3 at that time that the cross-delta route might
4 be preferable in that it would avoid crossing
5 certain areas that have been traditionally used
6 by the people from Aklavik, Fort McPherson
7 and Arctic Red River.

8 The preliminary engineering
9 and environmental studies were summarized in a
10 report which was issued in June of 1975. This
11 report showed that while there were certain
12 engineering and environmental problems the
13 route was feasible from an engineering standpoint,
14 and that there were both advantages and disadvan-
15 tages from an environmental standpoint. On
16 balance, it appeared that the cross-delta route
17 would be preferable. Additional studies in
18 greater detail were under way at that time and
19 these studies have since been completed and in
20 my opinion support this conclusion.

21 The environmental studies
22 include detailed field work by L.G.L. on birds;
23 by Renewable Resources on mammals; by Aquatic
24 Environments on fisheries; and by R.M. Hardy &
25 Associates on vegetation. In addition, Arctic
26 Gas purchased reports of the detailed environmental
27 studies conducted by the producers which had been
28 undertaken in the areas around the production
29 sites, including Parsons Lake, Taglu, and
30 Niglintgak. These documents have been filed

Webb, Dabbs, Gunn, McCart
Jakimchuk, Rowe
In Chief

1 with the Commission and discussed in earlier
2 hearings in Inuvik. As a result of these
3 studies, we have sufficient information to make
4 an environmental assessment of the cross-delta
5 route. We recognize the importance of much of
6 the delta as a very productive ecosystem in the
7 Arctic, and more effort has been expended on
8 a unit basis in this area than on other portions
9 of the pipeline.

10 The mitigative measures
11 which have been described earlier to this
12 Commission will, of course, be applied where
13 required in the delta. The land portion on
14 the delta crossing will be constructed during
15 winter. There will, however, be some necessary
16 summer activity in the delta and this will in-
17 clude the construction of four major and one
18 minor channel crossings and will require activity
19 in the channels at staging sites or construction
20 pads at either end of the crossing. As for the
21 compressor station construction, the personnel
22 will be confined to the working area and routings
23 for the necessary aircraft support to the summer
24 operations will be chosen based on wildlife
25 sensitivity. The one compressor station which
26 will require aircraft support during operations
27 will also have that support directed over
28 specific routings and at specific altitudes
29 in order to mitigate potential impact, parti-
30 cularly on the birds.

Webb, Dabbs, Gunn, McCart
Jakimchuk, Rowe
In Chief

1 This next sentence has been
2 added since the text was originally circulated. It
3 reads as follows:

4 " It should be noted that
5 this compressor station site has been moved now
6 to Tununuk Junction. However the comment regarding
7 routings still apply.

8 Delta Assessment.

9 The portion of the cross-
10 delta route which traverses the outer delta
11 should be easier to revegetate than the adjacent
12 uplands along the west side of the Mackenzie
13 Delta, which were crossed via the original pipe-
14 line routing. The ease of revegetation is due
15 mainly to the dynamic condition that exists
16 in the delta caused by the deposition of
17 nutrient rich sediments and the erosion
18 processes. Revegetation in this region will,
19 be aided by the more rapid pioneering of native
20 species. Potential problems associated with the
21 bank channelization, erosion and thermal
22 erosion and subsidence can be successfully
23 mitigated by engineering techniques and should
24 not have any impact on the river regime.

25 The portion of the cross-
26 delta route from Taglu to the Thunder River is
27 not considered to be significantly different
28 from the original Richards Island supply line
29 from a revegetation point of view. We believe
30 that the impact of the cross-delta route on

Webb, Dabbs, Gunn, McCart
Jakimchuk, Rowe
In Chief

1 revegetation would be less than the impact
2 to the original prime route on vegetation.

3 From a standpoint of
4 fisheries, the cross-delta route crosses
5 fewer streams but passes closer to more lakes
6 than does the original prime route. The original
7 prime route parallels more miles of streams
8 than does the cross-delta route. Most of the
9 potential impact of fisheries of the cross-
10 delta route lies within the delta itself.
11 However, many of the small lakes and ponds
12 within the Mackenzie Delta freeze to the bottom
13 in winter and thus have little importance to
14 fish species during the winter. There is
15 limited use of the Shallow Bay area by fish
16 during the time of the crossing construction
17 and only minor impact is expected. Other
18 channels are used for upstream migration and
19 monitoring will be required to be sure that
20 migration is not hampered.

21 Between Noel Lake and
22 Thunder River the segments of both pipeline
23 routings have similar potential impact, although
24 the cross-delta route may be slightly preferable
25 because it crosses fewer streams and has
26 fewer miles paralleling streams. On an overall
27 basis, we believe that the impact on fisheries
28 with the cross-delta routing will be about the
29 same as the original prime route, or possibly
30 slightly less.

Webb, Dabbs, Gunn, McCart
Jakimchuk, Rowe
In Chief

1 With respect to mammals,
2 the major advantage of the cross-delta route
3 is the reduction in the total miles of pipeline
4 right-of-way . Grizzly bear will be one of the
5 species which may be impacted due to the cross-
6 delta routing, however the major portion of the
7 crossdelta route is marginal grizzly habitat.
8 Richards Island is known to harbor a population
9 of grizzlies. However, the original route also
10 crosses Richards Island and there would appear
11 to be little difference between the two routes
12 with regard to impact on grizzlies. That portion
13 of the south-west corner of Richards Island
14 through which the new cross-delta route passes --
15 routing passes -- is not utilized for denning.

Webb, Dabbs, Gunn, McCart,
Jakimchuk, Rowe
In Chief

The possibility for an occasional encounter with polar bear along the cross-delta route is somewhat greater, but polar bear denning does not occur along any portion of either route. The cross-delta route is further removed from migrating and wintering caribou of the Porcupine herd, than the original prime route, and the potential impact is therefore less. The Dall sheep wintering in the Mount Goodenough area, will not be affected by the cross-delta route, whereas the route west and south of the delta passes closer to the winter range of this population, hence the potential impact would be lessened. Generally, the cross-delta route has less potential impact on on fur-bearer populations than does the prime route, which in itself has little potential impact. There is a potential conflict during construction of the Shallow Bay crossing with beluga whales. Whales use portions of the bay north, and on some occasions south, of the crossing each summer. Studies by F.E. Slaney --", I believe that should be F.F. Slaney and Company, "have shown that beluga are little affected by dredging and barging operations.

The Mackenzie Delta is an important area with respect to several bird populations, and the Applicant has carefully considered the impact of the cross-delta routing on bird populations. Probably, the most important species is the snow goose, that stages during the autumn in the delta, primarily in the area around

Webb, Dabbs, Gunn, McCart,
Jakimchuk, Rowe
In Chief

1 Shallow Bay, and west along the Yukon-Alaska coast.
2 The Shallow Bay area is important when early snow --
3 early snow falls make the north coastal area
4 unavailable to the staging geese. Populations of
5 breeding waterfowl are not dense along the proposed
6 delta crossing.

7 Since there is winter construction
8 proposed, there should be little impact on the
9 nesting birds or their habitat, although there will
10 be some minor disturbance due to the one or two
11 flights per month required at low levels for
12 inspection during operations and maintenance. Arctic
13 Gas will attempt to maintain a minimum distance of
14 two and one half miles from known peregrine falcon
15 nest sites and the pipeline route. Five nest sites
16 are known along the original prime route, and two
17 on the cross-delta route. Changes in routing
18 during the final design stages will further help
19 in alleviating potential peregrine falcon conflict.

20 Potential disturbance to birds,
21 created by activities associated with the operation
22 of the compressor station, will be alleviated by
23 careful selection of the flight path in and out
24 of the compressor station, and the maintenance of
25 altitude restrictions during flights to and from
26 the compressor station."

27 The following sentence is in
28 addition to the originally circulated text.

29 "With the location of the station
30 at Tununuk Junction, there will be less potential

Webb, Dabbs, Gunn, McCart,
Jakimchuk, Rowe
In Chief

1 impact on birds.

2 There are other considerations
3 which lie in the area of the physical environment,
4 concerning the comparative assessment of the delta
5 route, with the original ~~prime~~ route. The cross-delta
6 route, will require fewer borrow pits than the
7 original prime route. The cross-delta route avoids
8 slope stability problems. The cross-delta route
9 will avoid two river crossings with potential
10 difficulties; one on the Peel, and the other on the
11 Mackenzie. The crossings on the delta channels,
12 although longer overall, are in slow moving water,
13 and located in stable reaches of the river.

14 The potential impact on
15 archaeological resources will be less along the
16 cross-delta route than the original prime route,
17 because the west side of the delta has been
18 traditionally used by native peoples, whereas the
19 other portion of the cross-delta route is
20 subject to seasonal flooding, erosion and deposition.

21 The cross-delta route will
22 avoid the traditional hunting and trapping areas
23 in the vicinity of Aklavik, Fort McPherson, and
24 Arctic Red River. In addition, the potential IBP
25 site on the Rat River - MacDougall Pass area, will
26 be avoided.

27 Due to the reduction in the
28 right-of-way mileage along the cross-delta route,
29 there are two fewer compressor stations than will
30 be required for the original prime route," I will

Webb, Dabbs, Gunn, McCart
Jakimchuk, Rowe
In Chief

1 insert here a phrase, which is not -- had not been
2 originally circulated, after "prime route, under full
3 load conditions", should be added, "thereby
4 reducing the level of activity in the delta in term
5 of air traffic and river traffic.

6 In summary, although both the
7 original prime route and the cross-delta route
8 are acceptable, these considerations favour the
9 cross-delta route over the original prime route.

10 Q Mr. Rowe, could you go
11 on to deal with the environmental assessment of the
12 Telesat communication system?

13 A "Environmental Assessment
14 Of The Telesat Communications System.

15 The adoption of the Telesat
16 communications system has several environmental
17 advantages over the original proposed terrestrial
18 microwave system. Thus, there will be little or
19 no requirement for microwave sites off the right-
20 of-way, and hence, no requirement for helicopter o
21 ground access to these sites. There will be
22 obviously a saving in gravel and fuel during the
23 operating life of the pipeline. Probably the
24 treatest potential benefit has to do with the
25 elimination of towers as potential hazards to
26 migrating birds."

27 Q And could you deal now
28 with the Parsons Lake lateral?

29 A "Environmental Assessment
30 Of The Parsons Lake Lateral.

Webb, Dabbs, Gunn, McCart
Jakimchuk, Rowe
In Chief

1 The new alignment proposed by
2 Arctic Gas for the proposed Parsons Lake lateral,
3 lies closely along the alignment provided to this
4 hearing by Foothills. The area has been studied
5 in general by F.F. Slaney and Company. We expect
6 that the environmental impact will be similar to
7 impacts associated with the mainline in the general
8 area or with the originally proposed Parsons Lake
9 lateral."

Webb, Dabbs, Gunn
McCart, Jakimchuk, Rowe
In Chief

Q Now sir, could you deal with the Niglintgak supply line?

A "Environmental assessment of the Niglintgak supply line." I shall change slightly the first sentence as it has been circulated. "Arctic Gas has not studied this lateral supply line in detail from an environmental standpoint. There is, however, information available in similar terrain and habitat for the cross-delta route and the information is available from the work conducted by F. F. Slaney and Company. Details of the vegetation are available and the potential impact of the Niglintgak lateral will be similar to that of the cross-delta line.

There are no serious concerns from a vegetation standpoint.

Much of the lateral passes through terrain which is generally unsuitable for denning but five miles of the line border an area which has been used by grizzly bear and is suitable for denning habitat.

The construction of the Niglintgak supply line will be carefully monitored to minimize impact of denning grizzly bears. The Niglintgak supply line crosses three channels and parallels another channel for approximately three miles. There are eight lakes within one mile of either side of the pipeline. The results of studies indicate that the major importance of channels to adult fish is as migration routes.

All six lakes which have been

Webb, Dabbs, Gunn,
McCart, Jakimchuk, Rowe,
In Chief

1 examined in the corridor contain fish. Construction
2 will be monitored to prevent undue impact on the
3 fisheries and the flat terrain and winter construction,
4 there is likely to be little difficulty to fisheries.

5 The reports and studies and
6 documents relied on by the panel are set out in Appendix
7 A."

8 Q That's been filed as an
9 exhibit. Thank you Mr. Rowe. Next, vegetation. Mr.
10 Dabbs, could you deal with your evidence on this
11 subject, sir?

12 WITNESS DABBS: Heading
13 cross-delta vegetation. In my prepared phase three
14 evidence presented here in Yellowknife on November 17,
15 1975, I outlined the way in which we organized the
16 vegetation studies for this project. The three areas
17 of study included the vegetation surveys, revegetation
18 research and environmental monitoring.

19 The work undertaken relating
20 to the cross-delta route was largely an extension of
21 the survey program, though much of the new revegetation
22 work of the past couple of years has been on sites
23 within the delta. The report by Reid and Calder entitled
24 "The Vegetation of the Mackenzie Delta Area", December
25 1975, outlines the objectives and methods followed in
26 our field studies which led to our assessment of the
27 proposed route across the delta.

28 In summary, the report describe
29 the vegetation terrain relationships of portions of
30 three physiographic divisions in the Mackenzie Delta

Webb, Dabbs, Gunn,
McCart, Jakimchuk, Rowe
In Chief

1 area. The modern delta north of treeline, the lower
2 slopes of the Richardson Mountains and the wet lands
3 of the Peel plain between the Peel and Mackenzie
4 Rivers.

5 The aim of the study was
6 to provide base line information on vegetation composi-
7 tion, structure, successional processes and relation-
8 ships to the environment for use in impact assessment
9 and pipeline route selection.

10 The image that most people have
11 of the Mackenzie Delta has been formed from viewing
12 the delta landscape in Inuvik or Aklavik or during
13 boat or airplane trips between these communities.
14 It is important to realize the proposed pipeline route
15 crossing the delta does not traverse the type of terrain
16 and vegetation found between Inuvik and Aklavik.

17 The outer delta is very low,
18 flat, treeless and very close to sea level. This
19 newest portion of the actively developing delta is
20 subject to major natural perturbations and extremes
21 of such phenomena as flooding and deposition of river
22 sediment.

23 The plant communities of the
24 delta have developed in response to these conditions
25 by being able to rapidly colonize exposed soil surfaces
26 and to withstand repeated burial by silt deposited
27 during floods.

28 The adjacent uplands and both
29 the east and west side of the delta are of considerably
30 greater topographic relief than the active delta itself.

On these areas, landscape changes are periodically caused by thermal degradation and water erosion, especially on slopes.

8 The feasibility of assisted
9 revegetation of a pipeline across the outer delta has
10 been demonstrated over the past three years. Research
11 carried out in cooperation with the producing companies
12 has afforded us the opportunity to expand the re-
13 vegetation program into the delta, seeding abandoned
rig sites, sump pits and haul roads.

The results of this research are contained in the report, "Progress Report on River Site Seeding Tests in the Mackenzie Delta Region, N.W.T." by Younkin and Marten distributed to the participants in this Inquiry last week and filed today.

In terms of impact on vegetation,

Webb, Dabbs, Gunn
McCart, Jakimchuk, Rowe
In Chief

1 and ease of revegetation, few major problems are
2 anticipated for the cross-delta route. Not only are
3 the delta soils more nutrient rich and hence a better
4 growth medium, resulting in rapid recovery of plants
5 when disturbed, but also the new route is shorter
6 than the route skirting the delta, hence, less area
7 will be disturbed.

8 Q Thank you Mr. Dabbs.

9 Now, Dr. Gunn. Mr. Commissioner, I distributed a new
10 third page of Dr. Gunn's evidence the last session
11 and it has a number four at the top of it. It was
12 the fourth item with my letter. You'll see that there
13 is then some overlap. The previous page two, the
14 paragraph starting:

15 "Using the results for 1975 Studies".

16 The following paragraph on page two should be deleted
17 because they have been dealt with in the revised page
18 three. There is some minor changes in that as well.

19 Dr. Gunn?

20 WITNESS GUNN: Thank you.

21 The heading is --

22 THE COMMISSIONER: Excuse
23 me Dr. Gunn. Sorry, I just found that.

24 (UNIVERSITY OF SASKATCHEWAN, "WASTE HEAT RECOVERY
25 GREENHOUSE VEGETABLE PRODUCTION PROJECT -- PROJECT
26 REPORT, 1975; MARKED AS EXHIBIT 502)

27 (REPORT. L.S.L. LIMITED. ORNITHOLOGICAL STUDIES,
28 CROSS-DELTA ROUTE, SUPPLEMENT. JANUARY, 1976;
29 MARKED AS EXHIBIT 503)

30 (FISHERIES INVESTIGATIONS OF THE MACKENZIE DELTA

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16
- 17
- 18
- 19
- 20
- 21
- 22
- 23
- 24
- 25
- 26
- 27
- 28
- 29
- 30

IN THE VICINITY OF THE CROSS-DELTA ALTERNATIVE
PIPELINE ROUTE. PRELIMINARY REPORT. D. deGRAAF
& K. MACKNIAK, AQUATIC ENVIRONMENTS LIMITED.
DECEMBER, 1975; MARKED AS EXHIBIT 504.)
(REPORT. N.E.S. PROGRESS REPORT ON RIG SITE
SEEDING TESTS IN THE MACKENZIE DELTA REGION, N.W.T.
W.E. YOUNKIN & H.G. MARTENS, MARCH 1976; MARKED
AS EXHIBIT 505.)
RECOMMENDATIONS TO N.E.S. & CANADIAN ARCTIC GAS
STUDY LIMITED FROM AQUATIC ENVIRONMENTS LIMITED
MARCH 22, 1976; MARKED AS EXHIBIT 506)

WITNESS GUNN: Thank you, sir.

"Cross-Delta Route - Ornithology."

The decision to consider the cross-delta as a serious alternative was taken late in 1974, and consequently this alternative route was given prominent attention in our program for field studies in 1975.

L.G.L.'s work in this area began with a waterfowl study in the summer of 1970 . Studies of the snow goose autumn staging have been carried out since 1971.

A number of bird studies have been conducted by others in the Mackenzie Delta, but these were restricted to certain parts of the delta, or to certain times of the year or to particular species of birds within the delta, and so fulfilled only in part our needs in examining the cross-delta route.

Our program for field studies in 1975 followed the same pattern that we have utilized for baseline studies elsewhere along the route. These consisted of aerial surveys along the proposed route and ground transects undertaken at intervals along the route. These studies are described in

Webb, Dabbs, Gunn, McCart
Jakimchuk, Rowe
In Chief

1 the volume:

2 "Ornithological Studies - Cross-Delta Route."

3 MR. MARSHALL: That's Exhibit
4 395, sir.

5 A Exhibit 395, and
6 supplement to that volume.

7 Q That's Exhibit 503.

8 A Exhibit 503.

9 We conducted ground surveys
10 of terrestrial bird populations at nine sites along
11 the route during June and July of 1975. These surveys
12 were for the purpose of obtaining population indices
13 of birds in various habitats along the route. Based on
14 the densities of birds recorded in the habitats and
15 a subjective ranking of the relative abundance of the
16 habitat, deciduous scrub is the most important habitat
17 along the cross-delta route in terms of the numbers of
18 terrestrial birds which it supports.

19 We flew four aerial surveys
20 along the cross-delta route during the period June
21 to August, 1975. These were timed to examine the
22 water bird populations along the cross-delta route at
23 the times of spring and fall staging, at the time when
24 the birds are just starting to nest, and at the time
25 when the broods of young birds have come off the nests.
26 The outer Mackenzie Delta section of the cross-delta
27 route supported the greatest number of water birds
28 during June. The southern section of the route
29 around Travaillant Lake supported the greatest number
30 of water birds during late July and August. These

Webb, Dabbs, Gunn, McCart
Jakimchuk, Rowe
In Chief

1 surveys of the cross-delta route were conducted before
2 the large flocks of snow geese moved into the outer
3 delta during the fall.

4 We continued our studies
5 of fall staging snow geese in the Mackenzie Delta and
6 on the North Slope. These studies are part of an on-
7 going monitoring study of these birds. Normally, the
8 majority of the snow geese stage on the North Slope.
9 In 1975, however, the North Slope became snow-covered
10 in early September, and most of the geese moved into
11 the Shallow Bay area of the Mackenzie Delta. The
12 estimated peak number of geese present in that area was
13 325,000 out of a total of 375,000.

14 I would like to say, sir,
15 parenthetically that I have a few transparency slides
16 of that situation which I would like to show at your
17 convenience, maybe tomorrow or some suitable time.

18 THE COMMISSIONER: Fine.

19 A The balance of my
20 statement has been modified because of the change in
21 the ^{probable} location of compressor site CD-08. I go now to
22 revised page 3, using the results of our 1975 studies
23 plus various reports in the literature, we have made
24 an ornithological comparison of the cross-delta route
25 with the originally proposed circum-delta route. Our
26 conclusion is that from the point of view of the birds
27 that would be affected, the circum-delta route is
28 clearly preferable to the cross-delta route.

29 The principal factor in this
30 conclusion is the numbers of geese that stage in the

Webb, Dabbs, Gunn, McCart
Jakimchuk, Rowe
In Chief

1 outer Mackenzie Delta.

2
3 In the short term they would
4 be vulnerable to a disturbance that would be associated
5 with summer construction of the Shallow Bay crossing.
6 The next sentence has been modified. In the long term
7 the aerial and ground activity that would be associated
8 with the establishment and operation of a compressor
9 station and support facilities at the newly proposed
10 site selected in the delta for the life of the pipeline
11 would not, in our opinion, be likely to have a signi-
12 ficant impact on goose populations.

13 Then there is one sentence
14 deleted, and then we have gone on to make a number of
15 recommendations with respect to the cross-delta route.
16 The first is that the circum-delta route be built in
17 preference to the cross-delta route. The others are
18 mitigative measures that we feel should be implemented
19 if the cross-delta route is finally selected instead
20 of the circum-delta route.

21 Our principal recommendation
22 involves re-location of the compressor station site
23 now planned for the delta. We would prefer that if
24 possible all such facility sites be located outside of
25 the delta, or at least at the eastern and/or western
26 fringes of the delta. A sentence is added here, the
27 newly proposed site at Tununuk Junction places it in
28 the eastern fringe of the delta, and as such is a marked
29 improvement over previous sites, in our view, though
30 not quite as favorable a site as Tununuk itself.

Q Thank you, Dr. Gunn. Now

Webb, Dabbs, Gunn, McCart
Jakimchuk, Rowe
In Chief

1 Mr. Jakimchuk, please, would you please read into the
2 record your evidence pertaining to mammals?

3 WITNESS JAKIMCHUK: We conduc-
4 ted studies of mammals along the proposed cross-delta
5 route during 1975. These included aerial surveys in
6 July followed by detailed ground checks and additional
7 surveys in November.

8 The most serious potential
9 impact of the cross-delta route would be conflicts
10 with grizzly bears. This entire route intersects grizzly
11 bear range most of which is open tundra where bears
12 are vulnerable to harassment. Recommendations relating
13 to grizzlies similar to those advanced for the original
14 prime route apply to the cross-delta route. These
15 include:

- 16 1. Prohibit hunting by pipeline employees;
- 17 2. Avoid vehicular harassment of bears;
- 18 3. Strongly enforce the regulation to incinerate
19 garbage and avoid bear feeding;
- 20 4. Carry out a pre-construction den survey in October
21 to find grizzly bear dens on or near the pipeline
22 alignment in order to avoid disturbance to the
23 bears and their dens; and
- 24 5. Design and utilize bear-proof fencing for use
25 in problem areas.

26 As habitat for muskrat and
27 beaver is marginal along the cross-delta route, there
28 is little potential for impact on these species. The
29 greatest potential problem is the danger of local oil
30 spills. Strict care during construction and operation

Webb, Dabbs, Gunn, McCart
Jakimchuk, Rowe
In Chief

1 is required to prevent such occurrences. Beaver and
2 muskrat are resilient species which co-exist with
3 man's activities in other areas.

4 Although polar bears are
5 found infrequently along the cross-delta route, man-
6 bear encounters may increase with increased activity
7 associated with the pipeline. Such encounters could
8 create problems with individual bears. While the most
9 desirable measure is avoidance, problem bears will have
10 to be dealt with according to existing circumstances.
11 Tranquilization and re-location of bears is recommended
12 where possible.

13 Populations of fur-bearers
14 such as wolves, wolverine, marten, mink and lynx are
15 small along the cross-delta route and these species
16 are wide-ranging. As I have previously indicated in
17 testimony, I do not consider that pipeline construction
18 or operation activities will have a significant impact
19 on these species.

20 No den sites of Arctic
21 foxes or red foxes were found in the immediate vicinity
22 of the route, and surrounding areas apparently have
23 limited denning potential. Red fox were seen frequently
24 during November surveys but this species has displayed
25 a high adaptability to human activities throughout its
26 range.

27 Few moose winter along the
28 cross-delta route. Wintering occurs on the Campbell-
29 Sitidgi lowlands and the Thunder River Valley upstream
30 from the proposed pipeline route. Moose utilizing valleys

Webb, Dabbs, Gunn, McCart
Jakimchuk, Rowe
In Chief

1 of the Blow River, Rapid Creek, Conglomerate Creek,
2 and Walking River on the coastal plain, may encounter
3 summer activities such as borrow development and
4 compressor station operation. However, it appears
5 that moose on the cross-delta route will be little
6 affected.

7 The impact of the cross-delta
8 portion of the proposed route on caribou will be
9 limited. Potential for impacts on segments of the Blue-
10 nose caribou herd south-east of the delta exists if
11 utilization of this winter range occurs during the
12 year of construction. Previous recommendations regarding
13 conflicts with caribou should be implemented in the
14 event of an interaction. Interactions with woodland
15 caribou are unlikely because of the low numbers and
16 scattered distribution of this species.

17 Q Thank you, Mr. Jakimchuk.
18 Dr. McCart, would you please present your evidence on
19 fish?

20 WITNESS McCART: The Mackenzie
21 Delta is in the Arctic of North America and
22 its influence extends far beyond the delta itself.
23 It provides habitat for large populations of fishes,
24 many of them anadromous. Among the latter are several
25 species important in domestic fisheries: the least
26 and Arctic ciscoes, the humpback and broad whitefishes,
27 and the inconnu. These species utilize the delta
28 channels as migratory pathways, as rearing and
29 feeding areas, as overwintering habitat, and to a
30 limited extent, as spawning grounds. During the marine

Webb, Dabbs, Gunn, McCart
Jakimchuk , Rowe
In Chief

1 phase of their life history, they may be widely
2 distribruted along the Beaufort Sea coast. Arctic
3 cisco, for instance, which leave the Mackenzie Delta
4 in the spring, apparently move at least as far west
5 as the coast of the Arctic Wildlife Range in Alaska
6 during the course of their summer migration. Any major
7 changes in environmental conditions within the delta
8 which had a detrimental effect on populations of these
9 species could have geographically far-reaching effects
10 on domestic catches, both within the Mackenzie system
11 itself (e.g. in the Peel River and other upstream
12 tributaries where there are major spawning runs) and at
13 locations such as Herschel Island in the upper Yukon
14 Territory, and Barter Island in Alaska, where summer
15 catches in least and Arctic cisco are largely dependent
16 on fish originating in the Mackenzie system.

In view of its importance to fish, it is my opinion that the Mackenzie Delta must ^{be} accorded a high degree of protection. Any proposed development must be examined to determine its potential effects on aquatic environments, then carefully planned to either eliminate potential impacts or to minimize those which are unavoidable. Over the past year, AEL has carried out studies along the proposed cross-delta route. Our studies are sufficiently advanced that we feel that we can identify the major potential impacts of the development on aquatic systems and make some recommendations, both general and site-specific, regarding appropriate mitigative measures.

Most of our concerns are generally applicable to pipeline construction in the the north and have been discussed in detail during previous testimony before this Inquiry. I would like therefore, to concentrate my remarks on those impacts which are unique to the proposed cross-delta

Webb, Dabbs, Gunn,
McCart, Jakimchuk, Rowe,
In Chief

1 route. There are two of these: a potential for blockage
2 to fish migrations and a possibility of reduced
3 productivity in clear lakes subjected to increased
4 sediment loads.

5
6 Four major channels and Shallow
7 Bay will be crossed during the ice-free season. In
8 some instances, the construction period will continue
9 through the migration season (late summer and fall)
10 for anadromous fish migrating upstream to spawn and
11 overwinter. Any activity which seriously restricted
12 movement or caused damage to concentrations of migrant
13 fish could have a deleterious effect on populations.

14 We have recommended that the
15 movements and distribution of fish should be continu-
16 ously monitored during the construction period and, if
17 it appears that fish migrations are being affected, there
18 should be modifications in construction procedures to
19 mitigate the problem. These might include short-term
20 shutdowns to permit passage or rescheduling of some
21 potentially damaging construction activities such as
22 blasting so that they occur when fish are dispersed
23 rather than concentrated.

24 The clear lakes in the delta are
25 generally more productive than the turbid lakes with
26 more direct connection to river channels. In order to
27 protect the clear lakes from siltation, we have recom-
28 mended that they should be avoided by as wide a margin
29 as possible. One clear lake, however, lies astride
30 the pipeline route and will be bisected by the pipeline.

Webb, Dabbs, Gunn,
McCart, Jakimchuk, Rowe,
In Chief

1 Because of the disposition of other waterbodies, this
2 lake cannot be avoided although minor alterations in the
3 crossing site are still possible. We have recommended
4 that this lake be the subject of an intensive investi-
5 gation to ensure that the alignment does not interfere
6 with potentially critical areas such as spawning beds
7 and overwintering areas.

8 Q Thank you Dr. McCart.

9 Now Mr. Webb, would you please present your evidence
10 pertaining to whales? Sir there is a revised page
11 three that goes with Mr. Webb's evidence. The copy
12 that I had circulated, my secretary had ^{left} out a couple
13 of paragraphs, you've got that. It has a small five
14 at the top of the page.

15 THE COMMISSIONER: Right.

16 WITNESS WEBB: Sir, since I
17 last had the opportunity to present evidence before
18 your Inquiry in Inuvik in late January, I have had
19 the opportunity of reviewing with Arctic Gas personnel,
20 the current plans for crossing Shallow Bay. Those
21 plans have been reviewed in the light of findings over
22 four years of white whale studies in the Mackenzie
23 Delta estuary, including the Shallow Bay - West
24 Mackenzie Bay regions.

25 I would point out that three
26 reports, those covering the study seasons 1972, 1973,
27 and 1974, have already been submitted in evidence to
28 your Inquiry. I would add that I believe the draft
29 report covering the 1975 information has also been
30 submitted.

Webb, Dabbs, Gunn,
McCart, Jakimchuk, Rowe
In Chief

There appears to be two primary concerns with respect to white whales.

First, possible biological consequences to part of the whale herd from disturbance or harassment that may occur and,

Second, potential for interference with whale hunting by native people using the customary whale camps between Tent Island and Herschel Bay.

As a result of my review of Arctic Gas material, I believe that construction, operation and abandonment of the Shallow Bay crossing can take place without significant effect upon the whaling opportunity. Our studies have indicated that most of the 25 to 30 whales, usually taken by hunters in this area, are killed in Shoalwater Bay and West Mackenzie Bay, and not within the area designated as Shallow Bay. The majority of this harvest is taken over five miles from the planned crossing.

I must add that my opinion is based upon the understanding received from discussion with Arctic Gas personnel that boat and low-level air traffic in late June and during the month of July will be kept to a minimum throughout West Mackenzie Bay.

In the four years of observation major whale visitations to Shallow Bay occurred on an irregular basis. Whales were not seen to stay long in any year. Visitations ended on the following dates in July:

1
2
3
4
5
6
7
8
9
0
1
2
3
4
5
6
7
8
9
0
1
2
3
4
5
6
7
8
9
0

Webb, Dabbs, Gunn,
McCart, Jakimchuk, Rowe,
In Chief

In view of this, it appears safe to assume that normal numbers of whales would at least enter and remain in West Mackenzie Bay for periods of time similar to those which would have occurred without the pipeline crossing of Shallow Bay, even if construction occurred in July.

Whales in West Mackenzie Bay would continue to have the benefit of warm waters over its extent. Some whales may be denied the experience of slightly warmer and calmer waters in the middle and southerly portions of Shallow Bay, at least during the construction year.

It is not possible to accurately predict the biological consequences of that range restriction. However, some inferences may be drawn from existing knowledge. While studies have shown that some whales penetrate the middle portions of Shallow Bay on occasion, they do not remain there for long, probably because of hunting pressure from the seaward side.

In other words, under normal circumstances, they do not now receive sustained benefit of middle and lower Shallow Bay waters. Calving appears to take place successfully in West Mackenzie Bay. Surface waters there are well above 10°C after July 1st, an apparent requirement for calving.

Accordingly, it is my opinion that the biological consequences of such a range restriction may not be serious.

Notwithstanding the above, the

Webb, Dabbs, Gunn,
McCart, Jakimchuk, Rowe,
In Chief

1 following recommendations for assuring minimal disturb-
2 ance, have been made to Artic Gas:

- 3
4 1. That construction activity take place after the
5 majority of the whales are observed to have left the
6 area.
7 2. That supervisory monitoring surveys be undertaken
8 of both whale distribution and hunter harvest
9 success.
10 3. That boat traffic, particularly barges hauling
11 gravel from Shingle Point, occur after August 1st.
12 4 That aircraft over-flights of West Mackenzie Bay
13 at low levels be avoided in late June and the
14 month of July.
15 5. That aircraft and boat landings at whaling camps be
16 kept to a minimum.

17 Q Sir, you will recall
18 that there was a matter raised in Tuktoyaktuk con-
19 cerning some work that was done by a Mr. Paul Brodie.
20 You asked if Mr. Webb might comment on that when he
21 returned and I've asked him if he would do so.

22 A Yes sir, I would like
23 to comment on the role played by Dr. Brodie in the
24 1972 Slaney study. Dr. Brodie was a contract employee
25 of Slaney and related both to myself and to Dr.
26 Fisher of the University of British Columbia who was
27 an associate of Slaney and Company on that project,
28 performing as a specialist advisor in marine mammology.

29 With respect to Dr. Brodie's
30 written material, all pertinent parts of it were

Webb, Dabbs, Gunn,
McCart, Jakimchuk, Rowe
In Chief

included in our report. Some editing took place, essentially by myself in my role as project supervisor. Some of Dr. Brodie's material was rearranged. Some new material was added and some phrases and words were changed to improve the readability; at least in my judgment.

Extraneous material, material not pertinent to the purpose and objectives of the monitoring program, was omitted. In this category were references in two places to seismic exploration. The objectives of our program were to monitor and to report upon the construction of the artificial islands.

Webb, Dabbs, Gunn, McCart,
Jakimchuk, Rowe
In Chief

1 I would like to offer a copy
2 of all material submitted by Dr. Brodie for your review,
3 if you wish, except rough maps of whale distribution,
4 which were in such form that I thought not useful; and
5 the material is here if you wish it sir.

6 MR. SCOTT: Perhaps it should
7 be marked as exhibit Mr. Commissioner, so it can be
8 examined by various counsel.

9 MR. MARSHALL: I have no
10 objection to that.

11 THE COMMISSIONER: I think it
12 should be. Thank you Mr. Webb.

13 (WRITTEN MATERIAL BY DR. P. BRODIE MARKED AS
14 EXHIBIT NUMBER 507)

15 MR. MARSHALL: Mr. Rowe, could
16 you now proceed to present Dr. Banfield's evidence
17 pertaining to the environmental over-view of the cross-
18 delta alternative?

19 WITNESS ROWE: "The Mackenzie
20 Delta supports an enriched and diverse biotic
21 community because of the annual inflow and deposit
22 of nutrient rich silt, by the northward flowing
23 Mackenzie River. The faunal enrichment is expressed
24 in considerable stocks of renewable resources, such
25 as white whales, Arctic char, whitefish, inconnu,
26 water fowl, muskrats, beaver, moose and bears. These
27 natural resources historically have attracted a
28 relatively concentrated population of native people
29 to the delta, as a favourable settlement area.

30 The delta however, is not a

Webb, Dabbs, Gunn, McCart,
Jakimchuk, Rowe
In Chief

1 uniform unit, either geographically, physiographically,
2 or biologically. Treeline, which is a prominent
3 biological boundary feature, crosses the lower
4 delta, and associated with it are marked biological
5 differences between the lower and upper parts of
6 the delta.

7 The upper delta, south
8 of the treeline, is within the boreal forest biome
9 which has a less severe physical environment for
10 many animals. That part of the delta supports
11 high populations of fur bearers, and breeding
12 duck populations; also modest populations of
13 moose and black bears.

14 The lower delta, north of
15 treeline, is in the tundra biome. Here, a number
16 of physical factors, including shallow ponds,
17 lack of tree shelter, and cold winds from the
18 Beaufort Sea, combine to provide a less hospitable
19 environment for moose, muskrats, and beavers.

20 The modern delta physiographic
21 area, around Shallow Bay, is an active phase of
22 delta building, and the land is low and subject
23 to spring flooding and summer storm floods. For
24 that reason, few mammals inhabit it, and few
25 waterfowl nest in the area. The outer delta,
26 however, is an important waterfowl area, for some
27 nesting activity, but more so for loafing, moulting,
28 and staging, for autumn migration. The most
29 important species include whistling swans, white-
30 fronted and snow geese, black brant, pintails, and

Webb, Dabbs, Gunn, McCart,
Jakimchuk, Rowe
In Chief

1 sandhill cranes.

2 The eastern portions of the
3 outer delta, particularly the Pleistocene Delta
4 physiographic section, forms important habitat for
5 grizzly bears and reindeer herding. Between these
6 two portions of the delta, between the highly
7 productive upper delta, and the strategic outer
8 delta, is a middle area north of the treeline,
9 of lower productivity, as far as terrestrial
10 resources are concerned.

11 The proposed cross-delta
12 alternative route crosses the Mackenzie Delta in
13 that middle belt, avoiding to a great extent
14 conflicts with the more concentrated biotic resources
15 at each end. The various biotic components of the
16 delta environment, including vegetation, fish,
17 birds and mammals, have been studied in considerable
18 detail, during the past years, by consultants
19 engaged by Arctic Gas, as well as consultants
20 retained by the producer companies. There has
21 also been a considerable body of research literature
22 on the area since about 1935, for comparison.

23 I spent six weeks, during the
24 summer of 1946, in the delta, studying the muskrat
25 trapping industry, and I have re-visited the area
26 subsequently, on a number of occasions. The last
27 time was during August 1975, when I flew by
28 helicopter over the proposed route, and landed at
29 several points to visit research crews, and examine
30 local areas.

The early cessation of activity would also minimize interference with the autumn ^{of} migrations of anadromous fish into the delta. I do not believe the laying of pipe by barge has the potential of a severe impact on the white whale population. Studies have indicated that the upper reaches of Shallow Bay are less favoured than the lower bay, Mackenzie Bay, and Kugmallit Bay. It has also been shown that the whales show little alarm around large barges. If it were deemed necessary, an underwater alarm system could be installed, downstream from the slowly moving barge.

1 At no time would the upper reaches of the bay be
2 completely blocked, entrapping any whales present.

3 Considering these possible
4 mitigative measures, I envisage no environmental
5 hazard sufficiently important to prohibit the
6 construction and operation of a buried chilled
7 pipeline along the route. Comparing it with the
8 alternative prime route around the delta, I believe
9 that it has a slight over-all advantage, although
10 it is clearly less advantageous to birds, considered
11 in isolation. A systematic comparison of the
12 environmental impacts of the prime and cross-delta
13 alternative, has been presented in the environmental
14 statement. Some of the advantages of the cross-delta
15 route include the following.

16 (a) Its shortness, 104 miles
17 shorter.

18 (b) The ease of re-vegetation --
19 re-vegetating the modern delta.

20 (c) The avoidance of the
21 Mount Goodenough Dall sheep.

22 (d) The avoidance of periodically
23 used caribou winter range, on the east slope of
24 the Richardson Mountains.

25 (e) The avoidance of traditional
26 hunting territory, traplines, and fishing camps,
27 of the people of Aklavik, Fort McPherson, and Arctic
28 Red River.

29 (f) The avoidance of skirting
30 the productive upper delta.

Webb, Dabbs, Gunn, McCart,
Jachimchuk, Rowe
in Chief

1 It is not possible to compare
2 these social and environmental trade-offs, in
3 quantitative terms at this time, in view of a
4 lack of a recognised method for such, and analysis.
5 It is hoped that more sophisticated quantitative
6 data may be available in the future, on such social
7 environmental components, to form the basis of such
8 an analysis.

9 Finally, the evidence gathered
10 to date indicates that the proposed pipeline
11 crossing of the Thunder River, at the southern end
12 of the cross-delta alternative route, is below
13 the moose wintering grounds in the Thunder River
14 valley. That would mean that the winter construction
15 of the pipeline would not block any important
16 movement of moose, downstream to the Mackenzie
17 River shoreline."

18 MR. MARSHALL: Thank you Mr.
19 Rowe. Mr. Commissioner, that completes the presentation
20 of the direct evidence. I understand from Miss
21 Hutchinson that coffee is ready, if you wish to take
22 a break now, before cross-examination.

23 WITNESS GUNN: Mr. Commissioner,
24 before we take a break sir, just for the sake of the
25 record, in the first paragraph of Dr. Banfield's
26 statement, there's a word "geologically", and I think
27 it was read "geographically", and it might make some
28 difference to the interpretation.

29 THE COMMISSIONER: All right.
30 We'll adjourn for coffee.

(PROCEEDINGS ADJOURNED FOR A FEW MINUTES)

Webb, Dabbs, Gunn, McCart
Jakimchuk, Rowe
Cross-Exam by Bayly

1 (PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

2 MR. HOLLINGWORTH: Sir, Mr.
3 Bayly has kindly consented to precede me in cross-
4 examination.

5 THE COMMISSIONER: All right
6 then, go ahead, Mr. Bayly.

7 MR. BAYLY: Mr. Commissioner,
8 I am prepared to go ahead of Mr. Hollingworth, who I
9 understand has lost most of his voice. With just one
10 reservation, that I'd like to be able to look at, those
11 things that were filed today and the recommendations
12 of Renewable Resources which we understand may be
13 filed tomorrow, and I may have additional questions
14 arising out of that material.

15 THE COMMISSIONER: All right.

16
17 CROSS-EXAMINATION BY MR. BAYLY:

18 Q Now, gentlemen, since you
19 were last here we have heard some evidence on the
20 possibility of aircraft harassment of wildlife of
21 various sorts, and we've received some evidence which
22 will be given later on by Mr. Heacock of the Ministry
23 of Transport for Commission counsel with regard to
24 regulations for aircraft flights, overflights.

25 Can you tell me, and in
26 particular Mr. Jakimchuk and Dr. Gunn, whether you
27 have had a chance to read that evidence?

28 WITNESS JAKIMCHUK: No, I haven't.

29 Q Dr. Gunn, have you?

30 WITNESS GUNN: No, I haven't.

Webb, Dabbs, Gunn, McCart
Jakimchuk, Rowe
Cross-Exam by Bayly

Q As I understand it, Mr.

Heacock states that

"An imposed altitude of 2,000 feet is possible for aircraft following instrument flight rules but that for visual flight rules traffic the controls are not available."

I understand that aircraft using visual flight rules include all helicopters and most light aircraft. Is that your understanding?

A Yes.

Q There is a suggestion in that evidence that a restriction at least on the part of the Ministry of Transport on flight frequency would be impossible to impose. Now, can you tell me whether the recommendations that you have made, starting with Mr. Jakimchuk and ^{then} Dr. Gunn, were counting on the Ministry of Transport being able to impose regulations on the height of flights and on the frequency of flights?

WITNESS JAKIMCHUK: I can't really say I was counting on the Ministry of Transport to do it. Our recommendations are just that. They are recommendations based on the experimental studies we conducted. They are guidelines to provide what we feel is an adequate margin of safety to avoid disturbance, and I would distinguish between disturbance and harassment, harassment being a deliberate act. Our recommendations went to Arctic Gas and Arctic Gas has formulated a policy for those who fly for them. I would -- I can certainly see problems although I haven't read

Webb, Dabbs, Gunn, McCart
Jakimchuk, Rowe
Cross-Exam by Bayly

1 that testimony yet, but I would think that there may
2 be a possibility for more controls than you have
3 implied.

4 Q You'd agree with me,
5 though, that somebody would have to enforce these
6 recommendations for the impacts that you have suggested
7 would occur to be the same as those you predicted.

8 A Yes, and as we're all
9 aware from reading the newspapers, a clear case of
10 this has been done on the east coast with respect to
11 the intervenors on the sealing operation back there.

12 Q Yes, and Dr. Gunn, have
13 you any thoughts on this that you could share with the
14 Inquiry?

15 WITNESS GUNN: I agree with
16 Mr. Jakimchuk that my position is not that I was counting
17 on the Ministry of Transport to do this, but I feel that
18 we are into a new situation here, that we haven't come
19 across before, we haven't explored before, and I think
20 it's too early to say that it's impossible to do this.
21 I feel that more research is needed, more effort is
22 needed. I feel that it is possible to do it.

23 Q All right, so you would
24 say that whether we use the Ministry of Transport
25 regulations or not, there may be a way to regulate the
26 frequency of flights as well as the height, both of which
27 are important to the birds that you have referred to in
28 your previous testimony.

29 A Well, I feel that the
30 ultimate regulation of the flights is the responsibility

Webb, Dabbs, Gunn, McCart
Jakimchuk, Rowe
Cross-Exam by Bayly

1 of the Ministry of Transport. They have that respon-
2 sibility so that anything that is done has to be done
3 with their co-operation and co-ordination.

4 Q And your opinion would
5 be then that the most effective way to police this
6 would be through the government agency as opposed to
7 company regulations?

8 A Yes sir, I do.

9 Q Now, I don't know, Mr.
10 Rowe, whether you can speak to this on behalf of Arctic
11 Gas or not, if you can't I'm prepared to leave this
12 question for Mr. Hemstock when he returns. But can you
13 tell me whether or not Arctic Gas was expecting that
14 the Ministry of Transport would supply the necessary
15 flight restrictions to give the necessary rules to
16 implement the recommendations of the environmental
17 consultants to Arctic Gas?

18 WITNESS ROWE: We have proposed
19 and have in force at the moment, flight regulations which
20 we designed for the use of the company. At this time we
21 did not expect that M.O.T. would have regulations in
22 force. We designed our own to suit the needs of the
23 project.

24 Q And is that its present
25 needs, or is that for its projected needs when pipeline
26 construction would begin?

27 A The regulations are
28 designed so that they will cover the effect on wildlife.
29 They have not been specifically designed for any parti-
30 cular phase of the project.

Webb, Dabbs, Gunn, McCart
Jakimchuk, Rowe
Cross-Exam by Bayly

1 Q And has any co-ordination
2 to your knowledge taken place between the engineering
3 consultants and the environmental consultants with
4 regard to the number of flights that will be required
5 both to plan and construct the new prime route as it's
6 shown on the map behind you?

7 A The environmental consul-
8 tants have been appraised of all the constructional
9 plans as they are developed.

10 Q And does that include the
11 number of flights that would be necessary in order to
12 survey, plan for and supply this new route alignment?

13 A Perhaps you might ask the
14 consultants. They would probably be better at replying
15 than I am.

16 Q Has anybody on the panel
17 received that information from the consultants that
18 are in charge of either engineering or logistics,
19 whatever this falls under? Dr. Gunn, for example?

20 WITNESS GUNN: I believe that
21 that information is available to us. I might say that
22 in terms of timing of flights, the only place where we
23 have recommended that timing of flights is important is
24 in overflights of snow geese. Otherwise we feel that
25 height restrictions and the use of corridors would be
26 satisfactory.

27 Q We have heard last week
28 from Mr. Williams of the number of days approximately
29 to construct the Shallow Bay crossing. I understand we
30 didn't hear how many flights that would involve and whether,

Webb, Dabbs, Gunn, McCart
Jakimchuk, Rowe
Cross-Exam by Bayly

1 especially towards the tail end of the season when the
2 geese may be staging on the west side of the delta,
3 whether there would be a conflict with the number of
4 flights you have suggested, and the number that would
5 be required to finish the construction?

6 A I don't believe we have
7 that information available to us. If it was presented
8 in evidence in the past week, I personally have not
9 seen that evidence.

10 Q Now, we heard from Mr.
11 Lewis that the west side of the Shallow Bay and the
12 mouth of the Mackenzie Delta may be subject to erosion
13 and is in fact actively eroding. Mr. Williams last
14 week suggested that Arctic Gas has three options for
15 dealing with the erosion of the west side of Shallow
16 Bay, and one of these he called channel training, and
17 that involved stabilizing about a mile of shoreline as
18 I understand ; the second was deep ditching the line
19 an extra thousand yards; and the third one was that
20 because erosion seems to be proceeding more slowly in
21 recent years, to deep ditch an extra 500 yards and
22 stabilize the bank ten years from now, if required.

23 Now is this engineering series
24 of techniques, information that this environmental panel
25 had before it to consider, especially with regard to
26 the effects of these various methods on staging birds,
27 on vegetation, and on fish and whales? Mr. Dabbs, do
28 you want to start on that one?

Webb, Dabbs, Gunn, McCart,
Jakimchuk, Rowe
Cross-Exam by Bayly

1 WITNESS DABBS: Well, excuse
2 me, I don't recall it being formally introduced to us
3 as a group, but it has been available to myself, and
4 close examination of the air photos of the proposed
5 delta route, and the various alternatives that are on
6 the map behind me, and I have looked at that from
7 the standpoint of the types of shoreline that are
8 currently actively eroding as opposed to those that
9 are not so actively eroding. For my own information
10 really, trying to relate that to delta land form types,
11 and types of vegetation that are found there, to
12 see if it's a predictable or recurring thing, that
13 rate of erosion is related to some particular features
14 of the landscape.

15 Q Have you spoken to Mr.
16 Williams, or other people with Northern Engineering
17 Services, with regard to which of the three methods
18 outlined by Mr. Williams you would recommend from
19 a re-vegetation point of view?

20 A No I have not made a
21 choice of those three options, or made a recommendation
22 directly.

23 Q All right. Have you been
24 asked for an opinion on them?

25 A No, I don't believe I
26 have.

27 Q Did you know there were
28 the three of them?

29 A I was aware of them --
30 the three, yes.

Webb, Dabbs, Gunn, McCart,
Jakimchuk, Rowe
Cross-Exam by Bayly

1 Q Perhaps now, Mr. Webb, you
2 could tell us whether or not you were aware of these
3 possibilities, and whether you've been asked for an
4 opinion as to the effect they might have on the
5 movement of whales.

6 WITNESS WEBB: No, I wasn't
7 aware of them, Mr. Bayly, and haven't been asked an
8 opinion.

9 Q Now, that might be something
10 that you'd want to look over, overnight, and if you
11 can give us some kind of an opinion, tomorrow, I'd
12 be grateful. If not, and you need more time, please
13 tell us.

14 A I'd be very glad to find
15 out what I can about it.

16 Q All right. Dr. Gunn, were
17 you aware of the three possibilities outlined in the
18 evidence given last week by Mr. Williams, and were you
19 asked for an opinion on them?

20 WITNESS GUNN: No, I don't
21 believe that we were aware of this matter, and we have
22 not been asked for an opinion.

23 Q And would you be willing
24 to look at the evidence of Mr. Williams, and perhaps
25 tell us tomorrow whether you could give us an opinion,
26 either tomorrow or later on?

27 A Yes, certainly.

28 Q And, Dr. McCart?

29 A WITNESS MCCART: No,
30 I wasn't aware of them and no, we hadn't been asked for

Webb, Dabbs, Gunn, McCart,
Jakimchuk, Rowe
Cross-Exam by Bayly

1 an opinion, and yes, I would be willing to take a look
2 at the evidence and give you an opinion tomorrow, if
3 possible.

4 Q Thank you sir. This is
5 the shortest interchange Dr. McCart and I have had so
6 far.

7 MR. MARSHALL: That's what
8 happens when the witness gets to do the talking.

9 THE COMMISSIONER: I thought
10 it was a significant interchange.

11 MR. BAYLY: Mr. Jakimchuk, as
12 this may be of some concern to you as well, could you
13 tell us whether you and Mr. Williams have -- or anybody
14 else -- have discussed these three possibilities?

15 WITNESS JAKIMCHUK: I was aware
16 of the -- some discussion taking place by the engineering
17 panel on erosion problems on Shallow Bay. But not
18 specifically of those three possible alternatives; have
19 not been asked to render an opinion, and would be
20 prepared as Dr. McCart is, to take a look at it.

21 Q Thank you sir. Dr. Gunn,
22 turning to you again, and this is a bit off the subject
23 of the cross-delta, but is one in which the Commissioner
24 asked be addressed to you. When we were in Tuktoyaktuk,
25 Mr. Bertram Pokiak told us that his experience was
26 that in some late summers, migrating geese, unable to
27 nest on Banks Island, sometimes return to the mainland
28 and nest around Baillie Island; and are you familiar
29 with this occurrence sir?

30 WITNESS GUNN: All I can say

Webb, Dabbs, Gunn, McCart,
Jakimchuk, Rowe
Cross-Exam by Bayly

1 is that occasionally, some small numbers of geese nest
2 in that vicinity. Not regularly from year to year, but
3 nothing like numbers that normally nest on Banks Island

4 Q Yes. He was suggesting
5 that it was a phenomnom that didn't occur that often,
6 but had occurred in his experience.

7 A Yes, I would agree with
8 that.

9 Q He had suggested, when
10 he gave his evidence to the Inquiry, that perhaps it
11 should be considered that Baillie Island should have
12 some kind of special protected status because of this,
13 and would that be something you'd be able to give an
14 opinion on, either now, or at some later time?

15 A I'm not sure that we have
16 enough information about what happens on Baillie
17 Island during the breeding season. That has not been
18 within our scope. However, it seems like a reasonable
19 suggestion.

20 Q Now Mr. Rowe, again I'm
21 going to ask you to comment on the evidence, if you
22 can, that was given by Mr. Hemstock, and if you could
23 turn to page 7 of the evidence please. He stated in
24 the evidence in the second paragraph on that page that
25 "the cross-delta route will avoid the traditional
26 hunting and trapping areas in the vicinity of
27 Aklavik, Fort McPherson, and Arctic Red River",
28 and can you tell me, having been to the Aklavik
29 hearing, whether you're aware that several residents
30 identified the Shallow Bay and west delta area, and the

Webb, Dabbs, Gunn, McCart,
Jakimchuk, Rowe
Cross-Exam by Bayly

1 eastern North Slope area, as being of prime importance.
2 They referred to it in various metaphors as being the
3 area from which they got much of their meat and fish.

4 WITNESS ROWE: Yes, I recall
5 that.

6 Q And is that consistent
7 in your opinion with the statement made on page 7 in
8 Mr. Hemstock's evidence.

9 MR. MARSHALL: I think the
10 matter speaks for itself, surely Mr. Bayly. The
11 statement's there in the evidence.

12 MR. BAYLY: Perhaps the witness
13 could explain the statement made in the evidence. I
14 don't wish to be unfair to Mr. Marshall's client or
15 its consultants.

16 A I would prefer to wait
17 until Mr. Hemstock is here. He prepared this.

18 Q Dr. Gunn, when you were
19 here last, we had asked you to compare the various
20 routes in order of the preference which you would give
21 to them, from the point of view of the birds, which
22 are your major concern, and we now have more routes,
23 two more routes than before, and they are the new
24 prime route, the original prime route, the interior
25 route, and the -- what has been referred to as the
26 Barry route. Would you be willing to rank those in
27 order of your preference from the point of view of
28 the avoidance of impacts and interactions with birds?

29 WITNESS GUNN: I think we are
30 clearly on record as preferring the interior route,

Webb, Dabbs, Gunn, McCart,
Jakimchuk, Rowe
Cross-Exam by Bayly

1 over the coastal route, and preferring the circum-delta
2 route over the cross delta route. That leaves the
3 Barry route, --

4 Q Yes, I think that's what
5 it's been referred to.

6 A We have looked at the
7 Barry route, and we have some preference for the Barry
8 route over the prime cross-delta route, from the point
9 of view of birds.

10 MR. SCOTT: Mr. Commissioner,
11 can I interrupt briefly at this stage. You will recall
12 last week that Mr. Williams gave evidence about the
13 Barry route, and described the most southerly line on
14 the map that is behind the panel, as the first Barry
15 route, and the middle line as the modification or the
16 second route that Dr. Barry came up with. I discussed
17 the matter with Dr. Barry yesterday, and though no
18 harm is done by it, that in fact is a misunderstanding.
19 The first line was a line that Dr. Barry drew very
20 roughly, on a piece of paper, to indicate generally what he
21 had in mind. It was never intended by him that that
22 should take on the exalted status of a route. When
23 he looked at the matter carefully on maps of appropriate
24 scale, he drew the line that is in the middle, and that
25 is the only line he would like to have designated by
26 the title "Barry route," at the present time. So perhaps
27 in justice to Dr. Barry, and because he does not
28 advance the bottom line as a particular route -- when
29 we're speaking of the Barry route, we should be
30 understood now to be speaking only of the center line.

Webb, Dabbs, Gunn, McCart,
Jakimchuk, Rowe
Cross-Exam by Bayly

1 MR. MARSHALL: Perhaps, Dr.
2 Gunn, you could indicate whether or not you've ever
3 examined that route. It starts out as a blue route,
4 and then a black line, on the map that's behind you.

5 WITNESS GUNN: In that case,
6 I should modify my statement. We have not given
7 very detailed attention to the black route, but on
8 our first examination, we feel that this is probably
9 less preferable , than the prime cross-delta route.

10 MR. BAYLY: And perhaps you
11 could tell us what the differences might be, and from
12 your point of view, and what the disadvantages of that
13 pipeline route are?

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

Webb, Dabbs, Gunn, McCart
Jakimchuk, Rowe
Cross-Exam by Bayly

1 A Yes sir, I think I can
2 best do that by presenting for your examination some
3 maps that we have prepared of the two routes. They
4 don't include the middle black one. They include the
5 other two superimposed on distributions of geese such
6 as we found in 1975. I have several copies of those
7 here which I could distribute, sir, and I think it
8 would clarify the situation.

9 Q I'd appreciate that, sir, yes.

10 MR. MARSHALL: Perhaps, Dr.
11 Gunn, if you could identify these maps and the material
12 accompanying them, Miss Hutchinson could mark them
13 as exhibits.

14 A Yes. These
15 maps are taken from our cross-delta report for
16 snow geese survey in 1975 so that they are already
17 before the hearing, which has a heading,

18 "Figure 1,"

19 deals with

20 "Snow Goose Distribution, 1975 as determined
21 by aerial surveys."

22 It also shows on it transposed
23 on ^{it} is the portion of the prime cross-delta route, if
24 I may call it that, and secondly, the lower of the two
25 routes on the map behind me, in other words, not Dr.
26 Barry's preferred route, but the one that was originally
27 discussed.

28 Then the other map which has
29 a heading,

30 "Figure 4,"

Webb, Dabbs, Gunn, McCart
Jakimchuk, Rowe
Cross-Exam by Bayly

1 because it was taken from Figure 4 in our report is a
2 similar map but it shows distribution of other types
3 of geese, white-fronted geese, black brant, Canada
4 geese, unidentified dark geese lumped together because
5 they might be either white-fronted or brant or Canada,
6 and also whistling swans. So I would like to turn now
7 to the map headed "Figure 1" which deals with snow
8 geese, Mr. Bayly, if you have that.

9 MR. BAYLY: Yes, I have that.

10 (MAP FIGURE 1, SNOW GEESE DISTRIBUTION 1975
11 MARKED EXHIBIT 508)

12 (MAP FIGURE 4, OTHER GEESE DISTRIBUTION 1975
13 INCLUDING WHISTLING SWANS MARKED EXHIBIT 509)

14 A You can see that the
15 -- in comparing the prime cross-delta route with the
16 lower of these two lines, we preferred the lower one
17 in terms of snow geese because it missed most of the
18 important areas on either side of Shallow Bay by going
19 south of them. It does go through an area on the west
20 side of Shallow Bay that is marked as intensively used
21 by snow geese in 1975 but that area was not used
22 intensively in 1973 or '74. The areas in '73 and '74
23 that were used intensively were on the east side of
24 Shallow Bay. So that from the point of view of the
25 snow geese, we prefer the southern route, if I may
26 call it that as against the prime route.

27 However, if we look at the
28 middle route, black route, you will see that it cuts
29 back over to the east side of Shallow Bay through
30 some of the densest area used by snow geese. So that

Webb, Dabbs, Gunn, McCart
Jakimchuk, Rowe
Cross-Exam by Bayly

1 we're not particularly in favor of that.

2 THE COMMISSIONER: Mr. Scott,
3 I'm curious about that, because Mr. Williams of Arctic
4 Gas, who was a witness last week, said that the black
5 route in the middle was sort of a compromise route that
6 Dr. Barry and he worked out. You're sure --

7 MR. SCOTT: Dr. Barry will be
8 here tomorrow and will be able to comment if there's
9 any doubt. After Mr. Williams gave his evidence we
10 sent him a copy of what Mr. Williams had said, and my
11 understanding from talking with him yesterday was that
12 Mr. Williams had misunderstood, that the bottom line
13 was simply a rough line that he drew on the map of
14 inappropriate scale, and that when he looked at the
15 maps which I think are 50 to 1, he then selected the
16 middle line and he indicated to me that he didn't allow
17 for any engineering compromises in selecting that.
18 Now, if I'm wrong he'll be able to tell you tomorrow.
19 I may say that he said that he proposed that because he
20 was concerned about the concentrations of snow geese that
21 are north-west of his line, and which don't appear to
22 be shown in very large quantity at least on Dr. Gunn's
23 maps.

24 MR. MARSHALL: Sir, the bottom
25 line on the map that's on the wall, the blue line, was
26 the interpretation that N.E.S. gave to the little one-
27 page 7 x 11 sheet of Dr. Barry, and obviously Dr. Barry
28 didn't agree with that, and Mr. Glasrud was at the meeting
29 with Mr. Williams and Dr. Barry and he confirms that the
30 black line shown there represents what Dr. Barry wanted

Webb, Dabbs, Gunn, McCart
Jakimchuk, Rowe
Cross-Exam by Bayly

1 as his route.

2 THE COMMISSIONER: Well, go
3 ahead. Sorry to interrupt.

4 WITNESS GUNN: Yes sir. I might
5 say that one of the things that we liked about the
6 southern-most route is that the junction between the
7 two lines took place actually at Tununuk rather than
8 farther north at Tununuk Junction and to us that was
9 an important plus.

10 If I can turn now to the
11 second map, of the other geese and swans; the distributio
12 of white-fronted geese is shown by cross-hatching going
13 diagonally from upper left to lower right, and the
14 lower route crosses through some of this but not nearly
15 as much as the prime cross-delta route, and that has
16 to do with white-fronted geese.

17 The hatching going the other
18 way relates to brant geese and there appears to be more
19 of an impact on brant geese on the southern route than
20 on the prime cross-delta route, but when we look at
21 the figures on this, this difference is not really
22 very great. We're talking in terms of about 500 brant
23 are seen on one survey, along the prime route, as against
24 maybe 250 brant, plus 900 dark geese on the other route
25 on another day.

26 Finally, the swan areas are
27 completely avoided by the southern route, whereas the
28 prime route crosses a pretty good swan area. Now if
29 we look at the black route on that map, and try to
30 visualize it on here, we see that it goes through

1 some pretty good areas for both coast and water-fronts.
2 It doesn't avoid them nearly as well as the northern
3 one. So again we would have reservations.

4 Also one thing being as late
5 the junction of the lines would be at Tundra Junction
6 and not at Tukeruk.

7 MR. PARRY: Thank you, Dr. Gove.
8 I wonder if any of the other environmental consultants
9 to Arctic Gas had gone through a similar process in
10 assessing the two possibilities for a possible
route that have been presented both by the applicant
and by Dr. Parry? Did you do that, Mr. Gove?

11 PARRY: Yes, I had an
12 opportunity to see them and I think I can perhaps
13 sum up my opinion by saying that the route furthest
14 from the mouth of the river would involve more
15 whales. The black route or Parry route would involve
16 slightly more whales more often, and the designated
17 route in red would involve again perhaps more whales
18 more often. I think, though, you need to take into
19 account the possible biological consequences of even
20 the greatest potential interaction, as I've said is
21 the outermost route and I think those consequences are
22 probably not -- would probably not be serious conse-
23 quences.

24 I indicated that. Your
25 two points are one you just made, and the other one
26 being that the farther up-river you are the less
27 likely you are to have interference between pipeline
28 activities and whales.

A That's right.

had a look at the possible delta crossing routes?

Q All right, and Dr.

WITNESS McCART: There are
ble on the two southern channels.
blue route, as shown here,
es close to a large number of
e number of channels, and
t on this basis. The Barry
similar to the red route, it'

Webb, Dabbs, Gunn, McCart
Jakimchuk, Rowe
Cross-Exam by Payly

1 somewhat longer. The crossings of Shallow Bay and
2 Reindeer Channel are somewhat larger, apparently from
3 an engineering point of view more difficult and we
4 would expect that equipment would be operating in the
5 area for a longer period of time, and we would not
6 particularly like this.

7 The other thing about the
8 Barry route is that it crosses Moose Channel very
9 close to the mouth of the Big Fish River, which is one
10 of the two major Arctic char runs, on the west side of
11 the channel, and we would have to look rather closely
12 at this to see whether it might interfere with the up-
13 stream movement of Arctic char into the Cache Creek
14 drainage out behind Aklavik.

Webb, Dabbs, Gunn,
McCart, Jakimchuk, Rowe,
 In Chief

Q Do you prefer to see that
 farther downstream for that reason?

A Yes.

Q Mr. Jakimchuk?

WITNESS JAKIMCHUK: Yes,
 we've taken a look at the Barry Route and while we
 have no specific field information and have not
 conducted field studies on it, we reach some tentative
 judgments and that is essentially there's virtually
 no difference from the standpoint of mammals and I'm
 excluding the marine mammals. There's virtually no
 difference between the two routes.

The only, and this is a very,
 in my opinion, insignificant difference, is that the
 Barry Route tends to approach better quality beaver
 and muskrat habitat. In other words, the habitat
 quality for those species of aquatic fur bearers
 increases south in the delta.

Apart from that on a species
 comparison, there's virtually no difference whatsoever.

WITNESS DABBS: Excuse me,
 Mr. Bayly.

Q Yes, Mr. Dabbs.

A One comment I had failed
 to make, though from a revegetation point of view, I
 see that the southern routes are marginally preferred
 as I said but from an impact point of view, I believe
 that the southern most route shown here is the least
 desirable, as it traverses somewhat more mature delta
 land forms, infilled back-swamps, infilled meander

Webb, Dabbs, Gunn,
McCart, Jakimchuk, Rowe,
In Chief

1 channels and the successional change which would
2 follow through construction there would be more
3 marked and there would be a greater degree of contrast
4 following construction through that area than either
5 the Barry route or the current Arctic Gas prime route.

6 Q Now I notice from what
7 you said, Dr. McCart that in some areas, that is the
8 knowledge of certain populations using this area of
9 fish, there isn't very much information and perhaps the
10 panel would care to comment on the level of information
11 that either you or others have been able to gather
12 and whether you feel that from an environmental point
13 of view, you know as much as you feel you should, to be
14 able to say more than just that it's feasible, but to
15 be able to make suggestions to the engineers of where
16 a cross-delta route should go and what kinds of things
17 should be avoided both in time and geographical area?

18 MR. MARSHALL: I'm sorry,
19 Mr. Bayly, I'm having difficulty coming to grips with
20 your question. The consultants I think have indicated
21 where they conducted their studies and they've
22 done so in their reports. Do you want to know whether
23 have enough studies to be able to do comparative environ-
24 mental assessments of the various routes that are on
25 that map?

26 MR. BAYLY: I want to know,
27 Mr. Commissioner, whether the environmental consultants
28 are able to go beyond saying that the cross-delta
29 route, whichever one of the red, black or blue ones
30 is likely to be chosen, is more than just possible.

Webb, Dabbs, Gunn,
McCart, Jakimchuk, Rowe
In Chief

1 Are they able to provide any details of where it should
2 go. They've responded, I gather, to three routes:
3 one provided by the applicant, one provided by Dr.
4 Barry, and a compromise one provided by Dr. Barry and
5 Mr. Williams in conference. Are they in a position
6 to offer suggestions on where a cross-delta route
7 should go?

8
9 MR. MARSHALL: Do you want to
10 address a particular member to answer the question?

11 MR. BAYLY: Let's start again
12 with Dr. Gunn.

13 Q I take it my statement
14 was correct, Dr. Gunn that what you did do in looking
15 at the cross-delta routes was to respond to first of
16 all the applicant's route and then these other possibili-
17 ties?

18 WITNESS GUNN: That is correct.
19 I think that in terms of staging geese, our information
20 is quite adequate to reach the conclusions we have
21 reached. It's always possible to have more information
22 than you already have. We could perhaps add more
23 information about breeding waterfowl along those routes
24 for a better comparison, but I'm not sure that that
25 would necessarily enable us to come up with a more
26 definitive route for the engineers.

27 Q Dr. McCart, do you have
28 anything to add on this?

29 WITNESS MCCART: No.

30 Q You can't tell me, I take
it then whether any of these, the red, the black, or the

Webb, Dabbs, Gunn,
McCart, Jakimchuk, Rowe
In Chief

1 blue would cross over an area that might be of great
2 importance to one of the fish populations from the
3 state of knowledge --
4

5 A We have some suspicion
6 that there's a population of least ciscos spawning up-
7 stream of the cross-delta route that has been proposed
8 by the applicant. We know that it's not spawning in
9 the vicinity of our crossing and yet we know it's
10 passing through that area and that the fish are ripe.
11 It may be that it's close to the Barry route. We don't
12 know. Other than that, we have very, very little
13 information on the Barry route.

14 Q So it would be very
15 difficult for you to comment on the black or the blue
16 route as --

17 A On a purely statistical
18 basis , we wouldn't like the blue route because there
19 are far too many bodies of water involved. But as I
20 pointed out before, we can't make a very precise
21 comparison of the blue route with the applicant's
22 proposed route, simply because there are no data
23 available. By the nature of the fisheries business,
24 you can't simply take a few flights through an area
25 and determine the distribution of fish. You have to
26 get down.

27 One of the problems you have
28 of course, is that anybody can propose any route and
29 there millions of possible combinations through the
30 delta. The information is not available for most of

Webb, Dabbs, Gunn,
McCart, Jakimchuk, Rowe,
In Chief

1 the delta. Our work was confined to a comparison of
2 the applicant's proposed cross-delta route with the
3 original routing.
4

5 Q So given the state of
6 the data on the fish species using the delta, the only
7 thing that was really feasible to do was to look at
8 the particular route that the applicant had chosen
9 to ensure that at least it did not interfere with
10 spawning or any other important areas to the species
11 of fish?

12 A That's right.

13 Q O.K. Mr. Jakimchuk?

14 WITNESS JAKIMCHUK: Would
15 you care to rephrase your question again. I've kind
16 of lost what you were asking.

17 Q A short answer would
18 be "no", but I'll try.

19 A Well I can speak from
20 general principles, if that's what you're looking for.

21 THE COMMISSIONER: Go ahead
22 and then we'll ^{see} if we have to go further.

23 A O.K. Well, number one,
24 we don't ^{have} detailed site specific information for the other
25 routes as I've indicated. In terms of the level of
26 knowledge from general principles, the quality of
27 mammal habitat increases as one goes southward in the
28 delta. The habitat and terrain conditions are consider-
29 ably different than the outer delta. I've thought
30 for a considerable amount of time about what types of

Webb, Dabbs, Gunn,
McCart, Jakimchuk, Rowe
In Chief

1 things are dangerous to deltas and I've looked at some
2 examples or thought of some examples around the world
3 as to what happens in deltas and characteristically,
4 the most significant ecological impacts on river
5 deltas are those which affect the hydrological regime
6 at the source , the Aswan High Dam for example is one
7 case. Peace - Athabasca Delta is another.

8
9 From that, in terms of general
10 principles again, I have concluded that any disturbance
11 to a delta is better off taking place at the outer
12 fringes of it.

13 In the specific case of the
14 Mackenzie Delta, I've already indicated that all of
15 the studies that have been carried out on mammals,
16 with the exception of marine mammals, show that
17 habitat quality in populations are greater further south.

18 So that, having said all that,
19 I don't think it really matters too much because of
20 the paucity of the mammalian fauna in that particular
21 area, which of those routes would be chosen.

22 MR. BAYLY: Do you have
23 anything to add, Mr. Dabbs?

24 WITNESS DABBS: With respect
25 to the vegetation terrain; as we all know, there are
26 two very distinct differences in the Mackenzie Delta.
27 The upper or southern delta area are tree covered and
28 the area in which we're discussing. Within the area
29 which we are discussing for the purposes of a route
30 selection, many of the criteria that I would look at are

Webb, Dabbs, Gunn,
McCart, Jakimchuk, Rowe,
In Chief

1 available to me through careful air-photo examination
2 and I could, I feel, respond on the basis of air-photo
3 analysis to almost any route proposed as long as it's
4 within the area -- general area, the type of vegetation
5 which we have now studied.

6 Q Mr. Webb?

7 WITNESS WEBB: Yes, if I
8 understand what's required, Mr. Bavly, I would say
9 that the whale data upon which my opinion is based
10 upon is equally to all three options. There appears
11 to be no clear choice between the three routes under
12 consideration in terms of the probable effects of
13 construction and operation. However, I would add that
14 the innermost or southernmost route would reduce the
15 possibility of effects on whales.

16 Q Now, while you gentlemen
17 were trying to assess the possible impacts of a cross-
18 delta pipeline route, were your terms of reference just
19 to look at the construction of that route, or were
20 they to look at related activities and subsequent ones
21 such as maintenance and such as the possibility of
22 looping and the possibility that the pipeline would
23 be accompanied by increased traffic, seismic activity,
24 development wells, etc. Artificial islands or whatever?
25 Mr. Webb?

26

27

28

29

30

Webb, Dabbs, Gunn, McCart
Jakimchuk, Rowe
Cross-Exam by Bayly

1 A I'm sorry, I missed that
2 one completely.

3 Q Well, your terms of
4 reference when you were trying to provide an environmen-
5 tal impact assessment of the cross-delta route, did
6 they include only the construction of that route, or
7 did they include the subsequent activities, operations
8 and maintenance, increased exploration activity,
9 increased traffic by air, water and land, etc.?

10 A Yes, I tried to get a
11 clear impression of Arctic Gas plans as they are laid
12 out now with respect to all those phases, except
13 that I missed the possibility of having to stabilize
14 banks, bank erosion.

15 Q All right, and as I under-
16 stand, Dr. Gunn, you're in the same position, that you've
17 looked at subsequent activities in your assessment of
18 this route as well as the initial construction?

19 WITNESS GUNN: I think that
20 strictly speaking our terms of reference included the
21 activities related directly to the construction of the
22 pipeline, and to the operation and maintenance of the
23 pipeline. It was clear, however, that there would be
24 other activity in the delta itself and I think I
25 extended my interest in terms of reference somewhat
26 beyond that approval of Arctic Gas.

27 Q And did that include
28 looping?

29 A No, it did not.

30 Q Did it include looping

Webb, Dabbs, Gunn, McCart
Jakimchuk, Rowe
Cross-Exam by Bayly

1 with you, Mr. Webb?

2 WITNESS WEBB: No, I'm sorry,
3 I missed that. If you said looping I would have to
4 exclude that from the concerns that I addressed.

5 Q Mr.Dabbs?

6 WITNESS DABBS: I don't
7 believe that I, or I certainly don't recall the inclusion
8 of other petroleum field activities such as further
9 ,exploratory drilling, if that's what you meant by exploration, or
10 further seismic activities. Those are activities
11 within the industry, outside the scope of the Arctic
12 Gas project itself, and again I don't recall any
13 instructions regarding looping. My understanding of
14 a double line crossing in the channels is essentially
15 that in the first place, but I could be wrong.

16 Q Just to be clear though,
17 excluding the crossing of Shallow Bay itself, the
18 cross-delta route involves crossing different portions
19 of the countryside than the circum-delta route. There's
20 considerable miles across the delta itself excluding
21 the main channel.

22 MR. MARSHALL: Is that a
23 question, Mr. Bayly? I mean are you asking the witness
24 something or are you telling him something?

25 THE COMMISSIONER: Suppose
26 the witness comments upon it if he wishes to.

27 WITNESS DABBS: I'm sorry,
28 I understood it as the start of a statement.

29 MR. BAYLY: Let me start again
30 then. You've said that you considered the crossing of

Webb, Dabbs, Gunn, McCart
 Jakimchuk, Rowe
 Cross-Exam by Bayly

1 Shallow Bay to be looping in itself, is that correct?

2 A Well, I didn't wish to
 3 mislead you, as to what my understandings were. I
 4 looked at the map and the plans of a double crossing
 5 and I've never heard of any plans of looping, but
 6 it could exist.

7 Q Did you consider in
 8 your studies the possibility of looping those parts of
 9 the cross-delta route excluding the crossings of major
 10 channels?

11 A In my own mind I did.
 12 I don't believe they've ever been laid down specifically
 13 as terms of reference. My understanding of looping
 14 being based on what I've seen within Alberta and
 15 Saskatchewan of looped pipeline systems and yes, I
 16 would say that I would have considered looping as
 17 part of my assessment.

18 Q All right, Dr. McCart?

19 WITNESS WEBB: Excuse me, I
 20 must add another exception. I missed you saying, Mr.
 21 Bayly, the -- or asking whether I considered seismic
 22 and other exploration activities.

23 Q Yes.

24 A Well, perhaps I missed
 25 more of your list and perhaps I should state what I did review.

26 Q O.K., tell us what you
 27 did review.

28 A It was simply the
 29 -- those aspects of constructing and operating the
 30 cross-delta line as you see it developed, including

Jakimchuk, Rowe

Cross-Exam by Bayly

1

4

5

19

21

26

27

30

Webb, Dabbs, Gunn, McCart
Jakimchuk, Rowe
Cross-Exam by Bayly

1 the proposal for pipeline construction, operation and
2 maintenance.

3 Q We have been told,
4 gentlemen, that it's possible that the route that the
5 Arctic Gas or Foothills gas pipeline takes may deter-
6 mine or influence the routing of an oil pipeline, and
7 if you were looking at the cross-delta prime route in
8 terms of creating a corridor for an oil as well as a
9 gas pipeline, would you feel that you could endorse
10 it the way you have endorsed it as a gas pipeline?
11 I'll start with you, Mr. Webb.

12 A Mr. Bayly, if I could
13 just comment on that. I don't know if it's found its
14 way into Mr. Hemstock's analysis of the corridor
15 concept, but that's one of the areas that I find the
16 premise to be faulty with respect to the pipeline
17 guidelines, the premise that the gas pipeline will
18 act as a magnet for all and every future development,
19 and I think it's a fundamental deficiency in those
20 guidelines. You know, I just did not assume for
21 example, in our analysis that the gas pipeline would
22 automatically precede an oil pipeline in the same
23 area. But I certainly don't agree with that premise.
24 I think the guidelines should be changed.

25 Q Well --

26 MR. SCOTT: It's not important
27 for any of us to determine whether we disagree with
28 the premise laid down in the pipeline guidelines.
29 That's for someone else to say. Surely Mr. Bayly's
30 question is just directed to what happens if the

Webb, Dabbs, Gunn, McCart
Jakimchuk, Rowe
Cross-Exam by Bayly

1 premise is carried forward.

2 THE COMMISSIONER: Well, I
3 think that's true, but Mr. Jakimchuk was entitled to
4 express his dissent from the pipeline guidelines.

5 MR. SCOTT: And the order-in-
6 council, I believe.

7 THE COMMISSIONER: That's the
8 difficulty, gentlemen. The pipeline guidelines, whether
9 you like them or not, proceed on the assumption that
10 if you build a gas pipeline along the corridor from
11 Alaska or along the corridor from the delta to the
12 south, that you'll get an oil pipeline coming along after
13 it. That's not to mention a railway, hydro-electric
14 transmission lines and other things that I can't
15 remember now. So all Mr. Bayly is saying is, "All
16 right, we understand that you looked at this construction
17 of a gas pipeline across the delta, it's maintenance
18 and operation. We know that's what you looked at. Are
19 you willing to express any view as to whether you
20 would feel that an oil pipeline could be built without
21 substantial environmental damage across the delta
22 along the same route?"

23 That's all Mr. Bayly's asking
24 and maybe you'll be able to comment, you may not
25 wish to; I don't know.

26 MR. BAYLY: Give it a try
27 anyway. Do you want to start? Just assume, Mr. Jakim-
28 chuk, that we're stuck with the guidelines just for the
29 sake of the question.

30 A Oh, I quite agree that

Webb, Dabbs, Gunn, McCart
Jakimchuk, Rowe
Cross-Exam by Bayly

1 guidelines are there and they exist. All I said is
2 that I don't think it automatically follows that these
3 other developments will proliferate along a pipeline
4 right-of-way. For example, you ask about exploration
5 activities in the delta, well they were under way long
6 before a cross-delta routing was even proposed.
7 The seismic activity, the artificial islands and so
8 on, so I find it very difficult to come to terms with
9 the automatic linking of the gas pipeline and these
10 other developments

11 Q Assume it's a coincidence,
12 then, Mr. Jakimchuk, assume, though, that somebody
13 decided they wanted to build an oil pipeline along the
14 route of the gas pipeline because the gas pipeline was
15 there and something was known about that part of the
16 crossing of the delta.

17 A -O.K., just to answer it
18 simply to what I think is your question, I certainly
19 feel that the implications of an oil pipeline across
20 the North Slope and the delta are far more serious
21 than a gas line, and I wouldn't be prepared to say that
22 it would have an acceptable impact. Right now I feel
23 it would be unacceptable, in my opinion, according to
24 present technologies.

25 Q All right, and Dr.
26 McCart?

27 WITNESS MCCART: O.K., I tend
28 to agree that I think that it's feasible to put a
29 gas pipeline across there, certainly without doing, I
30 think, any great deal of damage to fish populations.

Webb, Dabbs, Gunn, McCart
Jakimchuk, Rowe
CrossExam by Bayly

1
2 But I don't know that I would have the same opinion of
3 a hot oil pipeline through the delta, nor would I like
4 to see a railroad through the delta along the same
5 corridor, or would I like to see a road through the
6 delta along the same corridor.

7 Q All right.

8 A Or a power transmission
9 line, or any of these other things that could concei-
10 vably be incorporated within the corridor through the
11 delta. If there's to be a corridor through the delta
12 it probably shouldn't be the one which is proposed
13 for the gas pipeline.

14 THE COMMISSIONER: Let's stop
15 a minute. You gentlemen are going a little bit
16 beyond what Mr. Bayly asked, but maybe --

17 MR. BAYLY: Don't stop them,
18 sir.

19 THE COMMISSIONER: -- no, no,
20 it's just as well to get your views because you're --
21 I don't have the guidelines in front of me, but as you
22 know, they were tabled in the House of Commons by the
23 Minister of Indian Affairs & Northern Development on
24 June 28, 1972. Leave the possibility of a railway and
25 hydro-electric transmission lines out of it. They say
26 dealing with this area that you gentlemen talked about
27 in your evidence at length last year and this year,
28 they postulate an energy corridor from Alaska across
29 either the North Slope or the interior route, and then
30 they postulate another corridor from the delta south.
That's what they say.

Webb, Dabbs, Gunn, McCart,
Jakimchuk, Rowe
Cross-Exam by Bayly

1 They were the product of a
2 great deal of consideration by the Minister of Indian
3 Affairs and Northern Development, and the Minister of
4 Energy; and the people in the various departments of
5 government concerned with this proposal. Now you just
6 dealt with the north slope as well as the cross-delta
7 route, Dr. McCart. Maybe we can just come back to
8 you for a minute, Mr. Jakimchuk, maybe you meant the
9 north slope, you were lumping it in with the cross-
10 delta route, but let us postulate a corridor, an energy
11 corridor, with gas and then oil pipelines across the
12 north ~~slope~~ and across the delta because that's the
13 route that Arctic Gas wants the gas pipeline to follow
14 now.

15 Your remarks, I take it, would
16 apply to the whole of that route, the north slope and
17 the delta, the two different areas, at least, they
18 appear to me to be.

19 WITNESS JAKIMCHUK: Well, the
20 implications I think are somewhat different, depending
21 on where you are, either the north slope or the delta.
22 I think I would comment however that as a general
23 statement, the implication -- environmental implications,
24 and let me restrict it to mammals, are far greater, with
25 a hot oil above-ground oil line, than they are for a
26 chilled buried gas line.

27 THE COMMISSONER: And when
28 you speak of mammals, you're really talking about the
29 north slope anyway, because you said that you weren't --
30 that the cross-delta route didn't really hit many --

Webb, Dabbs, Gunn, McCart,
Jakimchuk, Rowe
Cross-Exam by Bayly

1 the habitat of mammals.

2 A Yes, that's correct,
3 however there are different implications there that
4 relate to possibilities of spills, getting into channel
5 systems, and lakes and so on. In other words, they're
6 more far-reaching than, say, a breakage of a gas line,
7 so I can, even despite the fact that the alignments
8 we are looking at on that map, go through very marginal
9 habitat for mammals, the implications of oil spills
10 are far greater than a gas blowout, or a break in a
11 gas line.

12 Q Well, Dr. McCart, you
13 dealt with the whole picture just a moment ago. Maybe
14 Dr. Gunn, you'd like to comment on that?

15 WITNESS GUNN: Thank you sir.
16 I have a feeling that this panel is already on record
17 as finding that oil pipeline across the north slope
18 would have unacceptable impact. I may be wrong on this --

19 Q I think you're on record,
20 and I think the Environment Protection Board is on
21 record, but at any rate, if you don't mind just covering
22 the ground again, because it is an important question.

23 A I'll confine it to my
24 own opinion then. I believe that an oil pipeline across
25 the north slope would probably be unacceptable, although
26 we haven't considered it in great detail. In any case,
27 if that isn't acceptable, regardless of whether the
28 oil flows from east to west, or west to east, then I
29 see little likelihood of the use of an oil pipeline
30 along a parallel route to the proposed cross-delta

Webb, Dabbs, Gunn, McCart,
Jakimchuk, Rowe
Cross-Exam by Bayly

1 route, because it wouldn't be going anywhere, or coming
2 from anywhere, unless there were finds somewhere offshore,
3 that should bring oil in that direction. But in any
4 case, so I think it's unlikely, but if it were to be
5 a possibility, I would think that the oil pipeline would
6 present a considerable increase in the impact, and it
7 would require very careful consideration. In other
8 words, at the moment, I think it would be unacceptable,
9 but I would like more information.

10 Q Do you think it would be
11 unacceptable across the north slope and the delta,
12 following that route?

13 A Yes, yes.

14 Q From the point of view
15 of the bird populations?

16 A Yes.

17 Q Now, you said something,
18 I didn't quite follow, referring to the likelihood
19 of an oil pipeline being built along the corridor.
20 You said that it wouldn't be going anywhere. If an
21 oil pipeline were built along that corridor, carrying
22 oil from Alaska, that is from west to east, it would
23 presumably be carrying U.S.-Alaskan oil to the mid-
24 continent, to the U.S. centers in the mid-continent.
25 That's presumably what the authors of the guidelines
26 had in mind, I should have thought.

27 A Perhaps I didn't make
28 myself clear. What I meant to say was that if it's
29 unacceptable to run it across the north slope, and
30 that decision is accepted, then the other business of

Webb, Dabbs, Gunn, McCart,
Jakimchuk, Rowe
Cross-Exam by Bayly

1 running it across the delta, wouldn't come up, because
2 it's already defeated.

3 Q Yes, oh of course. Oh
4 I agree with that. I see your point.

5 MR. BAYLY: Dr. Gunn, we've
6 been told, when we were in Inuvik, that there's a
7 possibility that gas and oil may be found offshore, to
8 the west of the mouth of the Mackenzie Delta. That isn't
9 certain of course, but it's a possibility, and it might
10 involve at least a partial crossing of the north slope
11 by an oil pipeline, and that would be a situation in
12 which that possibility would arise, and I understand
13 your answer, at the moment, from the information you
14 have, that you would -- that would be an unacceptable
15 route, from the point of view of the birds, to bring
16 an oil pipeline.

17 A Well, I have to say that
18 I haven't studied the matter, I haven't studied the
19 relative impact of an oil pipeline versus a gas
20 pipeline. It's my general feeling that an oil pipeline
21 has a greater impact, but I don't know the degree of
22 that difference, so that I would not like to make a
23 blanket statement that the oil pipeline is unacceptable.
24 What I would say is that the chances are, the impact
25 would be considerably greater, and therefore, the
26 hazard involved might be very considerable, and might
27 be unacceptable.

28 Q Yes.

29 A From our point of view.

30 Q And I understand the

1 limitations of your answer, based on the fact that
2 you haven't looked at it in detail. Mr. Dabbs, would
3 you care to comment on that please?

Webb, Dabbs, Gunn,
McCart, Jakimchuk, Rowe
Cross-Exam by Bayly

1
2 WITNESS DABBS: I had an
3 answer for your original question which we've clearly
4 drifted away from. The original question asked if
5 we, when we were looking at the cross-delta route,
6 was an oil pipeline one of the considerations in our
7 terms of reference and I don't believe it was specifically
8 other than it is -- and we're quite aware of the
9 requirment here that I need to comment. The difficulty
10 that we all find in responding to the request for a
11 comment regarding other pipeline developments, namely
12 in oil, is a lack of technical understanding.

13 We feel we have a pretty
14 reasonable understanding of just exactly how the
15 engineers propose to build the gas pipeline and how
16 they propose to operate it and all we're doing is
17 speculating and as to how they might build an oil line
18 if it were routed across the North Slope, if they were
19 bringing gas onshore from the Beaufort Sea there,

20 My understanding of the
21 terrain -- the terrain types along the North Slope
22 and across the delta -- at least on the North Slope
23 would probably require construction on piles. Again,
24 I'm speculating. If so, then if that's built in the
25 winter time with a high degree of protection of the
26 vegetation, the presence of an operating oil pipeline
27 would have a minimal impact on vegetation, requiring
28 no or very little revegetation at all.

29 The consequences of a line
30 failure, of course are somewhat different -- are

Webb, Dabbs, Gunn,
 McCart, Jakimchuk, Rowe
 Cross-Exam by Bayly

considerably different and a line failure with gas will result in some destruction at the point of failure which is repairable. The consequences of a line failure transporting warm oil is one of considerably larger impact in a real extent. Still one, however, that in time is repairable, but not a desirable situation.

Across the delta, I frankly couldn't say -- couldn't even myself, in my own mind, guess as to how they would technically handle an ~~oil~~ line. If it was to across there, presumably built as the gas line and my concerns would be the same that Dr. Clark and Dr. Hollingshead would have relative to the stability of the soil. That hasn't answered your question related to the delta because I frankly couldn't say at this point what the presence of a warm oil pipeline would have other than a direct effect on vegetation immediately above.

Q All right. Mr. Webb?

WITNESS WEBB: Don't think me ungrateful Mr. Bayly, but I would rather not speculate on the matter at this time and I may add that when I was last before the Inquiry, Mr. Commissioner asked that I return render an opinion on the cross-delta route. At that time, I assumed that he meant the gas line. I made no further consideration. He gave me five weeks then. You could try me tomorrow to see if I feel any better about it tomorrow, but I can't guarantee that I will.

MR. BAYLY:

Well, perhaps you could try

Webb, Dabbs, Gunn,
McCart, Jakimchuk, Rowe
Cross-Exam by Bayly

1 and if you have any thoughts that you'd care to share
2 with us, even after tomorrow, you might be able to
3 convey them through your counsel.

4 Mr. Commissioner, I note
5 it's five o'clock and I was about to turn to another
6 area. I expect I have perhaps an hour or so left for
7 tomorrow.

8 THE COMMISSIONER: Right, well
9 then we'll adjourn till 9:30 in the morning.

10 (PROCEEDINGS ADJOURNED TO MARCH 23, 1976)
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

347
M835
vol.133

Canada. National Energy Board
Mackenzie Valley Pipeline-
Inquiry

DATE DUE

BORROWER'S NAME

347
M835
vol.133

